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THE DIETITIAN'S PLACE IN THE HOSPITAL RESEARCH PROGRAM[1]

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IT IS somewhat surprising to find that a discussion of the part which may be played by the dietitian in the formulation and execution of the hospital research program has not previously been presented before the national convention of hospital dietitians. I propose to speak in a practical down-to-earth fashion about this important subject.

Some of the questions which will occur to the dietitian concerning participation in the hospital research program are: 1. Why have I not taken part in it heretofore? 2. Am I one who should undertake any part of a research program? 3. How can such a program be carried out? 4. What sort of procedures, additional duties and difficulties are likely to be involved? 5. What benefits or satisfactions will come out of it? Although these five practical questions deserve honest answers the answers offered here may fall far short of satisfying many dietitians, chiefly because of the great variety of necessities and abilities surrounding and limiting every dietitian and her job.

1. *Why Have Dietitians Only Exceptionally Taken Part in Any Research Activities?* An important but not overwhelming reason is that probably the majority of dietitians are employed in institutions which have no research program and which offer no encouragement for its inauguration. Difficulties which arise if the dietitian attempts to plan such a program are *first*, no time allowed for other than routine duties; *second*, too little scientific training and interest on the part of both the dietitian and the other staff members; *third*, misunderstanding and discouragement by these same staff colleagues of the nursing and medical groups; *fourth*, lack of equipment, facilities and personnel. None of these difficulties are insuperable if they are recognized and intelligently attacked.

The dietitian's own scientific interest and education are certainly under her own control and may be enlarged both in training and on the job. Imagination, enthusiasm and perseverance unlock these doors just as they do all other doors

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to success. Leave of absence for summer session or longer terms of study are often granted by far-seeing institutions, and use of the medical library is certainly open to every dietitian everywhere. Attendance upon staff seminars or the initiation of a seminar or journal club are also within the reach of most dietitians in the larger hospitals.

Reorganization of routine duties so as to make the head save the heels may provide the extra time needed for such activities, and to the advantage of the routine. Perhaps the first bit of research undertaken by every dietitian should be a searching analysis of her own routine procedures to discover where she may inaugurate a constructive short cut with the help of flow-sheet, printed forms and recasting of the duties of her staff. She is more likely to undertake such an inquiry if she has urgent and constructive uses for the time released by such efficiency engineering.

The misunderstanding of research plans by other members of the hospital staff may be obviated most simply by saying nothing about such plans except when cooperation is needed. One must usually produce a small working model of what one means by research before cooperation can be expected and certainly talk about great plans for the future with nothing going on and nothing finished will bring about only suspicion and criticism. The first steps must somehow be taken unaided, in research as in every other worthwhile project.

Lack of equipment, facilities and personnel will preclude only certain kinds of research, the kinds which often appear most dramatic, but unquestionably do not preclude certain other kinds of inquiries. The latter type which can be done with only paper and pencil well directed by brains is the choice *par excellence* for the dietitian embarking on the research sea for the first time. In some hospitals, however, good laboratory equipment and clinic records lie unused, a monument to the wistful ambitions of medical staff or directors. The alert dietitian may shape her program to use an idle metabolism apparatus, blood analysis equipment, biophotometer, or x-ray machine. But physical equipment is not indispensable and indeed is unnecessary for the contributions which can be made only by dietitians.

2. *Who Should Undertake a Research Program?* The obligation is laid most heavily on those who head or belong to a large dietetic staff, particularly one which trains students, because the value and practicability of research is difficult to establish in the minds of dietitians who have seen no evidence of it in the hospital during their training course.

Dietitians in clinics and teaching hospitals which have an already established medical research program must find their niche in such a program or be content to take a permanently ancillary place in the professional scale.

Those employed in a small endowed hospital or in city or county institutions who are able to obtain volunteer or Works Progress Administration or similar free help for community service have also the opportunity and duty to undertake a research program, whether or not the hospital has any such program already in process.

The dietitian who undertakes research in any of these situations should be one who has already established her value to the institution, who has her routine of

preparation and service of meals functioning smoothly and who has the confidence of her superintendent, of the medical and nursing staffs and of her own colleagues in the dietetic department, not to mention the patients who present the raw material upon which she must count. Certainly the job for which the hospital engages a dietitian must first be well accomplished, streamlined and satisfactory before research can be incorporated into it.

3. *How May the Research be Inaugurated and Managed?* As previously suggested, the first steps may well be taken in the dietitian's own department by an analysis of every employee's job and particularly of the dietitian's own tasks. An analysis of costs of food and service as affected by season, mode of purchase, type of menu, changes in equipment or other important variables has much appreciated value for the hospital and may be helpful to other institutions. New and more accurate calculation of diet lists, including vitamin values in actual weights of the vitamins instead of in the outmoded plus or minus signs, or Sherman or even International units, is much needed and even demanded by progressive medical men. Active collection and use of laboratory material in the wards or clinics or from selected private patients may be undertaken with the cooperation of one or more of the medical staff. An alert dietitian will discern the interest of the physician in certain types of cases and will prompt him tactfully in regard to the possibilities of study. For example, water balances should be made on patients on ketogenic, diabetic, nephritic and on Sippy diets, also on the same patients with increase or decrease in salt intake. Water and salt retention by the tissues is imperfectly understood, particularly as affected by the acid-base equilibrium and by the proportions of fat and carbohydrate in the diet. Among these standard special diets there are excellent examples of all these variants so that the dietitian might collect records of fluid intake and output from as many cases as possible, classify them so as to be comparable as to reaction, salt intake or fat and carbohydrate content, and perhaps discern some understandable pattern in the results. But all the moves in such a study must be planned ahead much as one plans a chess game, and before the actual collections are begun. Sometimes this and other valuable data are already available on patients' charts but are not used for any research purpose. The wily dietitian will use routine observations made by the nurse and doctor whenever possible.

Another field in which the dietitian is untrammeled is in that of dietary case histories. Many such histories have been compiled, no doubt, but few of them have ever taught anyone anything because the compilers had no plan for their observations. Case histories on nephritic children with special attention to early viosterol or fish liver oil medication might or might not reveal some correlation of kidney damage with excess vitamin D intake. Case histories of rheumatic and arthritic children might show something as to the relation of these diseases to vitamin C intake. Case histories of allergic patients, of diabetics, alcoholics, cataract patients, obesity cases, all offer fascinating possibilities in the light of modern medicine.

A good example of such a study was

that done in 1931 by Laura M. Nicoli as a seminar student and while dietitian in the St. Francis Hospital in San Francisco. She studied three cases of intestinal disturbances as to the effect of increased vitamin B complex upon the progress of the patients. The patients and doctor were induced to try the effect of brewer's yeast (fifteen grams daily) as part of the treatment. Although one patient suffered from constipation and two others from different types of diarrheas, the dietitian put them all on a smooth bland diet of her own devising, with yeast. Restoration of appetite, improvement in the intestinal condition and striking gain in weight followed in all cases in from fourteen to twenty-five days. The interest and satisfaction of patients and doctor were indeed gratifying. A similar experiment today could be made giving crystalline thiamin in one case, riboflavin in another, and yeast in one or two others so as to discern the rôle of the various members of the B complex.

4. *What Are the Duties and Difficulties Likely to be Involved in Research Activity?* As must be evident, these will vary with the kind of program and with the amount of responsibility which the dietitian is willing and able to undertake. In a university hospital operated for medical teaching purposes, some research is nearly always underway in which the dietitian's aid is welcome. Any inquiry at all into diagnosis or treatment of patients suffering from disturbances of the cardiorenal system, liver or gallbladder disease, any of the anemias, diabetes, obesity, Addison's, Graves' or other diseases of the endocrine glands, will need the help of the dietitian. This means that the research of the department of internal medicine should interest her as though it were of her own devising. Indeed, in a few instances the dietitian has been known to prompt the internist. The departments of obstetrics and of pediatrics are also deeply concerned with problems of nutrition and the dentists are likewise now conscious of the dietetic angle of their subject.

The dietitian's contribution is likely to include planning and preparing weighed diets, supervising their service and keeping records of actual intakes, and training the patients accurately to follow dietary directions and to make reports on excretion, symptoms, etc. Constant study of the literature is necessary so that the dietitian may contribute constructive suggestions and criticisms to the medical group who are likely to rely on her for much of the food side of the study.

In non-teaching and smaller institutions the dietitian may need to make some of the laboratory tests or at least to start the laboratory technician in the necessary procedures. More often in these cases an intelligent rearrangement and study of routine examinations and records may provide the raw material for research study and conclusions. The routine blood and urine tests, blood pressure readings, basal metabolism, body weight, temperature, respiration, cardiographs and x-rays, if aligned according to some valid variant in the diet, may yield significant findings. It is amazing to think of so many thousands of these records made daily in hundreds of hospitals and clinics without correlation or benefit to anyone, often enough not even to the patients examined. Of course many of these records are worth-

less because they are incomplete or inaccurate and the dietitian's interest in them might help to improve this condition.

It is obvious that there are two entirely different lines of research open to the dietitian: (a) administrative problems of costs, labor management, housekeeping, instruction of student nurses and dietitians, etc.; and (b) problems in nutrition and diet therapy.

Most of the studies published in the JOURNAL of the American Dietetic Association are of the first kind. Since January 1938, there have appeared in this JOURNAL fifteen reports of research by hospital dietitians, six of which are concerned with diet therapy and nine with administrative problems. No dietitian's name has appeared as collaborator in any of the twenty-five leading articles dealing with conditions involving nutrition which the *Journal of the American Medical Association* has published since January 1, 1939. Some of the subjects treated without benefit of dietetic analysis are: management of hypoparathyroidism, (1, 2); use of protamine zinc insulin, (3, 4, 5); effect of alcohol on kidneys or liver, (6, 7); vitamin deficiency diagnosis and treatment, (8–16); gastro-intestinal disease, (17, 18); anemia, (19, 20); Addison's disease (21), pregnancy management (22), neonatal feeding (23), obesity (24), intravenous alimentation (25). Each of these studies could have been expanded and improved by an examination of the basal diets used. In several cases the whole point of the research turned on the composition of the diets but only guesses were made regarding them when they were mentioned at all. All of these represent dietotherapeutic studies in which the dietitian should take a hand even though she may not consider herself qualified to take the initiative.

Some of these nutrition studies require laboratory tests as well as dietary control and calculation but some do not. The latter group may be attempted by the dietitian on her own initiative since they require only use of the records of patients on weighed diets. The chief thing needed is *control* of the food intake and the experimental attitude. Above all, the charting of the whole procedure before any of it is undertaken is the one essential which cannot be overlooked. It is at this point that success is won or lost, something which no beginner in research has ever believed until too late and which many veterans in the field have never really learned. Our students want to take over the feeding and study of their rats or dogs at once when the problem is begun and make plans, solutions, and learn technics while gathering data. Perhaps this is as good a way as any to education in the scientific method but it involves waste of time, materials and effort. Perhaps one should attempt to write the report of the research before any of it is begun in order to become cognizant in time of all the data needed and the interfering conditions which must be recognized.

Research possibilities for the dietitian which will occur to any student of nutrition involve, for example, vitamin C and B_1 determinations on urine and vitamin A tintometer tests on blood and feces in cases of suspected deficiency (particularly in children and in the aged), measurement of milk secretion by weighing the baby before and after each nursing, comparison of effectiveness of reducing diets with photographs and

weight charts of subjects who might be student nurses and others of the staff, and effect of various laxative diets on number and volume of bowel movements.

5. *Finally, What Good is the Research After it is Done?* This is the most easily answered question of all. The chief good of the research comes not after it is done but in the doing of it. It carries a lift in itself which cannot be imagined by those who have not experienced it. It makes routine blessed with the spark lit by the prospect of a bit of that immortality so pitifully sought by humanity from its very beginnings. It has creative and constructive meaning which lifts a job from a means of living into a way of life. The dietitian is dealing every day with the raw material of health and life itself, the very foundation of all progress and happiness, correct feeding. From the cradle, which has had most of the nutritionist's attention heretofore, to the elderly ham-and-egger's rocking chair, lie unsolved problems of the effect of food on health, growth, reproduction, aging, mental stability and development. The trouble is not to find new questions to answer but to select among those pressing in on us those which should be attacked first.

Other rewards which will come to the dietitian who takes her place in the research program are found in the increased respect and understanding which is likely to be accorded her by her colleagues and employers on the hospital staff. This is likely to be conditioned also by the improved service to the patients and the medical staff which most of such activity involves. For example, light on the differences in the effects of diets used with protamine insulin and regular insulin serves the whole diabetic community. The study of the vitamin C or B_1 output of elderly people as compared with that of younger persons on given intake may result in some new menus for the old people's homes. A few experiments on the relation of pre- and postpartum diet to milk flow might reduce the proportion of lactation failures. No loyal dietitian will choose a problem which can have other than a beneficial effect upon its subjects and upon the institution.

Last but not least comes the obligation of writing for the benefit of others a lucid, modest but complete account of all such studies. Dietitians are fortunate in having their own official journal ready to publish such worthy reports. Its pages might well be used more largely than they now are for both independent and collaborative papers by active dietitians. Many of the reports of such researches as are suggested here, however, are likely to appear in the medical journals, headed by a medical collaborator's name. This is as it should be since the dietitian has now taken her place in the medical team. Again the report may appear in a management journal with or without the institution superintendent as collaborator. In any case the printer's business should be stimulated by the dietitian's taking a place in the research program.

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THE DIETITIAN IN THE VANGUARD[1]

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A NATIONAL convention is an occasion for taking stock. One obligation of the Association at its annual meeting is to recognize progress and to suggest possible avenues for further advances.

My purpose is not to present facts for your information nor is it merely to claim approbation for the work accomplished, although that is a worthy proceeding. It is rather, while acknowledging progress, to indicate opportunities for further growth and to point out places of greatest need.

To observe the steady expansion of the field, to watch the advances in training, to note improvement in services and to observe the esteem in which the dietitian of today is held, is extremely gratifying. We have accomplished much in a few years. We have had to work hard for our laurels and we should wear them with pride. Pride we have every right to feel, but heaven forbid that we should ever become complacent! That way lies stagnation and much remains to be done.

Happily, members of the Association vary in their dominant interest. All work toward the same end—the improvement of well-being through applied nutrition suited to physiological and psychological needs, and adjusted to economic resources.

What viewpoints in any situation, hospital or clinic, hotel or restaurant, tea room, school lunchroom, or in social work, should a forward-going dietitian have? One is a pronounced sociological slant, ability to see the entire field in relation to individuals and groups, to help in selection of food materials, in the use of surplus commodities, and to teach how to make limited, monotonous diets tasty and satisfying, for these are matters of concern to every worker in applied nutrition.

Relief officials in this tenth year of the depression must be made to realize that economics is a matter of consumption as well as production and distribution. Choice and use are potent factors and the dietitian's responsibility.

The second viewpoint essential is that of educational responsibility. Never was there a time, according to McLester,[2] when nutrition so held the center of the stage. Not only does the lay public realize the importance, but nurses and doctors were never more concerned with dietary adequacy. We fail to realize our birthright if dietitians are not found in the vanguard at this point.

The dietitian bears responsibility for the adequacy of normal diets in every detail, as well as for therapeutic diets. She must know the various sources of essentials that tend to be omitted from the usual diet of today—vitamin B_1 and the fractions of the vitamin B_2 complex, to name only a few, and to say nothing of the many minerals. If her post is in a hospital, then a willingness to discuss with doctors, to include on each

[1] Read before the General Session, American Dietetic Association, Los Angeles, August 31, 1939.

[2] J. A. M. A., May 21, 1939.

patient's tray these essentials, and to point out to the patient how they are supplied, is her function. Nutrition workers in other areas have similar responsibilities. Using every opportunity to establish good food habits is an ever present duty, whatever the area. Your inspector of training courses, Adeline Wood, noted a good example—whole wheat bread being given when a glass of milk was purchased in one school lunchroom. The attractive, adequate plate lunch is an educational demonstration. Teaching methods vary. Graphic representations are usually most effective.

We tend to decry the food faddist and certain over-zealous advertisers but is it not, in part, through their activities that people have come to recognize that there is a science of nutrition that has a direct bearing upon their health and their purses? Many are ready now to turn to the dietitian for reliable information.

This education must be personalized. A puzzled small boy in a vocabulary test defined an individual as "a piece of people". We must see the particular person in his particular situation. We need to adjust advice and education according to resources, family and social habits and intellectual level.

Another essential viewpoint is our obligation to contribute through research. Dr. Morgan has given a vital message on all phases of research, particularly in relation to nutrition in specific pathological conditions. Let me stress the gathering of data in administrative service. Opportunities for comparative studies in large quantity food service are boundless. It is easy to be smothered in conscientious attention to detail, with immediate tasks completely filling the horizon. When that happens a dietitian will never get that lift which comes to any person who realizes that but for her efforts that data would not be available, that better technic not recognized, or that improved procedure lost. Time is not so much an element as awareness of implications and comparative values.

Contribution to progress is one of the greatest of rejuvenators. Furthermore, a research attitude furnishes entrée to congenial professional friendships.

There are those among us whose primary concern is research, who with a keenly scientific attitude fix their attention upon a limited area and, for the moment, let their minds radiate from that focus only as far as light is thrown upon the object of their attention. These research workers are among our most valuable members, but it is to be hoped that they feel a real appreciation for the rank and file without whose efforts their work would not come to full fruition.

Another basic viewpoint is to realize our particular rôle. A clear understanding of our relational function is of utmost importance. We must recognize those areas that are primarily the responsibility of the dietitian and those in which supplementary aid of a definite nature is to be given. This distinctly does not imply taking a subservient position. In a coordinated program we walk abreast. *Coordinate*, that is our word and a great improvement over cooperate.

Finally, and doubtless the most important viewpoint, is the attitude toward the routine task of serving food to those in our care; food that is wisely selected;

prepared so that flavors are preserved; enhanced by judicious seasoning; and textures improved. Let us not forget that appearance—color and attractive arrangement—is not least in importance. In short, let there be a blending of science and art for which our training has equipped us. Psychological reactions as well as physiological needs must be considered. Let us not overlook the art. The main burden is carried in the daily round of duties. It is through adherence to high standards, loyalty to ideals, and observance of our code of ethics that our profession has attained its present status.

We have been considering a sort of ideal, composite dietitian. Let us look now at territories occupied and note our progress in them, and discern, if we may, other areas into which service might well be extended. The primary question is not one of promotion of dietitians for their own sake nor for the recognition of our profession, but having assumed applied nutrition as our province we are under moral obligation to occupy the field as completely as circumstances will permit. We have made a good start but we are a long way from complete coverage.

Dietitians in some institutions have, as their most obvious responsibility, direct food service, although the obligation to help establish good food habits is always present. These institutions include both non-profit and commercial units: hospitals and homes for the care of dependents, hotels and restaurants, college residences and dining halls, and school lunchrooms are among the units served.

In other agencies the rôle of the dietitian is counseling and educational. These agencies include the relief organizations, public health units of various types, industries that observe ethical standards in advertising and employ nutritionists to help carry them out, and others through which the public in general is reached through talks, radio programs, newspapers and magazines. The consultant dietitian for those who can afford to pay, and the clinic dietitian in outpatient departments must not be overlooked as effective educators.

What is the measure of our progress?

First in hospitals: Time was when chefs with their long period of apprenticeship, and nurses with their well established technics and professional ethics were somewhat skeptical of the ability of these newcomers with uncertain background, while doctors scarcely knew that we existed. I am speaking of the time long before the American Dietetic Association was organized. I have the advantage of some, if not all of you here today, because in those early years I held the honorable title of "dietitian and steward", at least fifteen years before the Association was organized.

The first dietitian was called to teach student nurses. Soon she was expected to introduce some of those new ideas about balanced diets and scientific food preparation. Occasionally she had the support of the administration and was given adequate authority. Often she had to placate the chef, subtly gain her point or retire to her diet kitchen defeated.

In the standard hospitals today the dietitian is an executive officer. She is head of her department, has a voice in building the budget for her division and controls food service from beginning

to end. Her office is readily accessible to physicians with whom she has frequent conferences. A part of the routine is bedside visits, where she counsels with patients to discover their likes and dislikes and educates them to select proper diets after they return home.

The more progressive hospital administrators, physicians and nurses expect a fully developed dietary department as part of standard organization. The American College of Surgeons requires it before giving complete recognition in their rating.

The science of nutrition developed rapidly with diet for the sick the most engaging aspect. Diet therapy had an intellectual appeal. The principles upon which applied nutrition is based were readily defined.

This was not the case with food preparation in general. It is true that certain underlying principles were recognized from the beginning, but it was not until the last decade that research in this field had made sufficient advance to give the subject as strong an incentive for scholarly effort as nutrition. The same thing was true of other factors in administration. The therapeutic dietitian was ensconced in her diet kitchen, the aristocrat of her profession. Often general food service and special diets were in two distinct departments. Never the twain did meet nor wanted to.

This is not the picture today in the better institutions. Now the practice of building special diets on normal meals is accepted practice. Also, the nutritional well-being of the entire hospital personnel is now a recognized aim. How the patient eats *after* leaving the hospital is also of concern to those who view their work in its entirety.

Before dietitian internships were offered, dietitians who had charge of general food service did not always measure up to their responsibilities. The jump from college class room to a large kitchen was too great. Pre-service training in home economics classes was somewhat at fault. Students did not get the whole picture. They were instructed in underlying principles of nutrition but the art of cooking was less esteemed. Too often the science of food preparation meant conserving nutritional but not necessarily esthetic values. Mastery of all the subject matter—instruction in all the approved procedures known to college faculties, even with a little practice work on the side—cannot substitute for actual experience on the job. Now a postgraduate year is provided under the auspices of the national Association. An index of the value of this experience is the attitude of students toward it. "I never learned so much in one year in my life" is a very common expression, somewhat to the chagrin of the undergraduate faculty, who thought theirs the major part. Every one of us owes a debt of gratitude to those who offer this postgraduate year. The directors of these courses in hospitals and in institution administration have helped tremendously to raise our standards. This in the long run affects the status of each one of us. Recent research has encouraged us to improve cooking technics. We know how and why green vegetables are kept green, meat is cooked with a minimum of shrinkage, and muffins have no tunnels. There was a time when hospitals generally did not have the reputation of serving good food. This was due in part to the patient's mental

and physical attitude, in part to limitations in the administration. It is difficult to conserve esthetic values in mass production of food but it can be done and increasing attention is being given to this point. The á la carte service introduced into many private hospitals is an indication of the trend to make meals more satisfying and to let patients know that their personal wishes are being considered. Visits to the patient by the dietitian in hospitals of all types are evidence of attention to individual desires as well as needs, whether based on nutrition or on racial tradition or family habits.

We must acknowledge, however, that even today in some hospitals the dietitian is just another worker rather than an executive. She does not have charge of food service but performs only such part of the routine as the hospital superintendent sees fit to allot to her. She merely carries out orders but does not help to formulate policies. She is at fault if the food budget is unbalanced even though she had no voice in setting it up. She may have no time to visit patients. Doctors who may wish to consult her find it too difficult since her office is remote from parts of the hospital they frequent.

This retardation may be the fault of the dietitian who shrinks from assuming control or who allows her attention to be entirely absorbed in the immediate and routine duties. It is not surprising that many shrink from extension of responsibility when the multiplicity of detail that demands attention is noted. Yet it was not until the work of food service, from beginning to end, was considered a unit and the dietitian became an executive with a staff, that the potential values inherent in the services of trained nutritionists were realized, and incidentally rank and salary more nearly commensurate with ability and training were attained.

It is well to remember that people are inclined to be influenced by a person's estimate of himself. We need to be wary lest the caution essential in those days, when we served with modesty and humility, carry over to the present when a more aggressive attitude is indicated. Tradition is a strong force.

In institutions for the dependent, progress has been extremely slow. Only a very few states use a dietitian for counsel, and a state dietitian responsible for food service in all state supported institutions is the rare exception. It is to be noted that dietitians are employed by single state institutions even when a state dietitian is lacking. This is a fertile field. The need is great in two directions. The first is for more adequate meals. The second is for better use of funds, and I am including both selection and elimination of waste. I served as advisory dietitian one year to the extent of making one twenty-four hour visit to the different institutions. The waste was appalling. As an economy measure, if for no other reason, appointment of a state dietitian would be more than justified.

Would it not be well for each local association to include in its program of work active support of a state dietary staff where it exists, or help to establish one where it is lacking?

We come now to consider the nonprofit college and school units. School lunchrooms occupy in some localities a less favorable position than before the

beginning of the depression. Trained managers have been replaced by experienced restaurateurs or in smaller schools by so-called practical women who needed the job. Some of the changes can be traced to political sources. But we must ask ourselves if the retrogression could have occurred if the manager had made enough of a feature of the educational aspects of her work, or is it possible that skepticism in regard to her ability along financial lines was warranted, or was the food served an example of what applied science and art can accomplish, or was she an efficient manager but with her back to the wall when the political attack came? Were local members of her profession aware that their support should have been brought to bear on the situation? Parent-teacher associations, if informed, have tremendous power. Who is to inform them? There is evidence of renewed effort by professional groups who are taking a more aggressive stand for the employment of trained managers and for school lunchroom directors to place more emphasis upon educational features.

I cannot quote statistics in regard to trained or untrained management in college residence and dining halls, but I could name several that are in the charge of commercial men or women rather than professionally trained administrators. This is true even in some localities where an academic department of home economics has existed for years. We need to discover the cause. Now that the fifth year's training is available for institution administration graduates, perhaps more rapid progress will be made in this field that surely has need of the services of those whose viewpoint is educational as well as directed toward efficient management.

What is the situation in commercial institutions? Convincing the general public of the value of college training, especially for managerial responsibility, is difficult. Where skilled technics are involved the hard-headed business man is inclined to be very skeptical. Even more discouraging is the attempt to get into the inner consciousness of students the conviction that the surest way to rise to the top is to begin at the bottom and that college training is the barest beginning. No one should enter this field who does not have a real feeling for fine food service. Science cannot be neglected if progress is to be made and managerial abilities are of first importance, but the fine art of food preparation must dominate if success is to be achieved.

Progress is evident. A short time ago a manager of a large building corporation asked for the names of graduates in institution administration. His comment was of interest. He said, "I am convinced that people have become aware of the type of food that institution administration graduates serve and have come to prefer it to the chef's type of meals. Hereafter, we will want home economics graduates for our tea rooms and restaurants".

Spotted all over the country are hotels, restaurants, tea rooms and cafeterias that take first rank in food service because they are manned by our graduates. Every dietitian is indebted to them, for each has served to make fine food service and our type of professional training synonomous to those who have had the good fortune to partake of their hospitality. And the converse is true. A

trained manager whose art is weak does our whole group immeasurable harm.

We come now to consider the situation in the various social agencies. What should our reaction be as we consider the program of relief in these past ten years and the part our members have had in it? Some administrators have been sufficiently far-seeing to employ home economists as members of their staff. Many others invite us in when crises arise, but lacking authority or any consecutive view the help possible in these occasional instances is distinctly limited.

Many relief and social workers have too great faith in the printed schedule of food allowances. Even when age groups, laborers, and white collar workers have specific allotments they cannot take into account local situations, racial traditions, family habits or any other of a dozen conditions that call for adjustment. The interest of the American Dietetic Association in this field of work is to see that home economists appointed to such positions are sufficiently well trained in the science of nutrition to give efficient service in food and nutrition problems.

For several years a joint committee of the American Dietetic Association and the American Home Economics Association has been formulating the minimum qualifications for home economists in public and private welfare agencies. The members of this association can render needed assistance by encouraging the employment of people with these qualifications. To be effective, the dietitian must have continuous contact with the field and first-hand knowledge of the way families in her particular district are living.

An aptitude for vicariousness, to use Dr. G. H. Palmer's expression, is necessary. This the home economist or nutritionist must acquire through her association with case workers. Rarely can she go directly into homes, but as the case worker seeks her advice, reports the success with which the schedules she has prepared are used, and brings back specific problems, she will be able to adjust the nutrition program to local conditions. All possible combinations of food that provide for adequacy must be appreciated even though unacceptable to American tastes. Utilization of local products and means of making monotonous diets appetizing can be well done only when families are seen in their particular situation.

The need for help in the nutrition program in social work is tremendous. Officials in relief must be made to see that increasing the allowance is not the sole answer to the problem. Training in better selection and use is of paramount importance. This work cannot be effectively done except under the guidance of one who is well trained in the science of nutrition. But this is not enough; that "aptitude for vicariousness" is also essential. It would seem that in pre-service training courses in the undergraduate years those in charge should be alert to discover students who show aptitude for this phase of nutrition. They should be encouraged to substitute sociology, psychology, and social work for some of the courses in institution administration and possibly enter a graduate school of social work. In the post-graduate school in the hospital, administrators should be ready to direct into social work those who show ability and interest in this field.

A demand for our graduates comes also from health departments. We have

reason for gratification since more than three-fourths of the states have at least one state nutritionist. This is an area that should bring large dividends in improved health, particularly in child welfare. Additions to the state office and through county health units is a development we should anticipate and support.

The question now becomes one of procedure. What is the best means of insuring progress along all fronts?

First: Research is a continuous obligation.

Second: More adequate manning of the occupied and potential fields in food service is needed. The first step for effective work would be surveys to determine status quo and to reveal new opportunities as suggested last year for the state group by Mary W. Northrop, past-president of the Washington Dietetic Association, and carried out by four committees. One assumed responsibility for health departments and relief agencies, another studied state institutions, the third took as its field dietary departments in hospitals. The study was made a joint project with the Washington Home Economics Association whose committees, with Ruth Walker as chairman, took school lunchrooms for their investigation. Now the two organizations are prepared to support those who are doing worthy work and to bring pressure to bear to improve conditions found to be unsatisfactory. In Portland the school lunch managers were brought together for instruction and help with their problems. Would it not be profitable for the national Association to encourage local units to undertake similar projects to determine what is being done and what needs to be done? It might be wise to start with the social service agencies. We are well aware of the tremendous sums used for relief purposes. We know also of their inadequacy. We must be conscious also of the fact that the knowledge dietitians possess is not being adequately used in the solution of this problem. That consciousness is too often a hazy feeling that there is a lack, rather than an awareness of the need of definite, concrete and factual information. We do need surveys to determine actual conditions.

The result of such an enterprise would be twofold. First, the data would be valuable; second, nothing would do more to unify interests and promote solidarity among members of the Association than working together on a common problem —close to their ultimate goal of improving nutritional conditions, yet not directly connected with their routine duties. Of course it would be unfortunate if the next steps to improve the situation were not taken, but that would assuredly follow. The American Dietetic Association through a national committee might well suggest definite investigations to local associations, help organize, define limits, outline procedures, present policies, and receive reports.

Third: Improvement of pre-service and in-service training in keeping with the extension of knowledge and improved technics is also indicated. There is need for intensive short courses since the free time of dietitians is limited. "Refresher courses" was the name Mrs. Marble suggested last year and it is a good one. Universities and colleges might be persuaded to offer two or three weeks' work so arranged that concentrated at-

tention would be given to one subject. The work of Margaret Gillam at the New York Hospital of the Cornell Medical Center, in cooperation with Teachers College, must be mentioned. But it is not necessary to depend entirely upon refresher courses. Mrs. Marble has suggested in an editorial in the August-September issue of this JOURNAL that every dietitian should devote at least one hour a week to professional reading. That would seem to be the minimum.

Long ago Mrs. Ellen H. Richards used to illustrate the need for nutritional information—"Man is the sickest beast alive." How much of this condition could be alleviated if the knowledge that dietitians possess could be more widely disseminated and put into practice in good food habits, is a question that should arouse us to more widespread activity.

The nutritionist must concern herself with service of food to meet immediate needs of those under her care and with education through demonstration and counsel that will help patients in hospitals, students in dining halls, pupils in school lunchrooms, and patrons in restaurants to improve their food habits.

To our members, relief agencies look for standards in allotment of funds, selection and use of food. The rehabilitation administration must depend upon us. Child welfare agencies need us. The national Association should keep the total problem before us all.

While the tide was somewhat against us, as we were feeling our way, we had no other choice than to move slowly. Today, a very different situation exists. The tide is with us. We do not want to be swept too rapidly into unknown waters. Nor can we merely rest on our oars and drift. We are now in a position to do our own steering but we must chart the waters. That is the next step.

ASPECTS OF THE FUNCTION OF VITAMIN E IRRESPECTIVE OF ITS RELATION TO THE REPRODUCTIVE SYSTEM[1]

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IT HAS now been securely established that there is a peculiar relation of vitamin E to the normality of the cross-striated musculature of the body. The absence of vitamin E from the nutrition of the rat infant during the suckling period, *i.e.* the first three weeks of life, leads to a widespread degeneration of the cross-striated or voluntary musculature (Olcott, 1938). It is unfortunately not yet clear whether this is a primary idiopathic degeneration of the musculature or whether the muscular lesions are secondary to primary nervous involvement, either of the cerebrospinal or more probably of the sympathetic system. The last-mentioned possibility has, in fact, not been explored, but a few years ago Lipschutz (1936) described definite cerebrospinal lesions in these young. It is highly interesting that an identical or related malady affects the musculature of all older animals reared and maintained on E-low diets (Ringsted, 1935; Burr, Brown and Moseley, 1937; [a] Knowlton and Hines, 1938; [b] Evans, Emerson, and Telford, 1938; Einarson and Ringsted, 1938), though the myopathy here never involves so much of the total musculature as is the case with suckling infants deprived of E; particular muscles of the flank, pelvic girdle or hind limb being picked out for widespread degeneration, while others are less affected.

As Einarson and Ringsted have shown, the chronic malady of older animals is apparently never the cause of their death, which is usually attributable to intercurrent infections producing pneumonia even though the disadvantage to locomotion may be very considerable. This is in contrast to the situation prevailing with suckling young. Here the mortality is high, from a fifth to a third of such infants dying suddenly, sometimes without premonitory signs. Some of the little animals die so suddenly that they do not show any symptoms of sickness or disability and are well-nourished. The cause of death is unknown. An elaborate electrocardiographic study has not shown us cardiac impairment and the myocardium is histologically normal, but in many of the cases degeneration of the diaphragmatic musculature has been found. A most singular thing is the occasional, spontaneous and complete recovery of young sucklings so badly paralyzed that they could not right themselves when placed on their backs. Some of those spontaneously recovering have been sacrificed when forty-five days of age, and their striated musculature is histologically normal and normal in creatine content, whereas this is never the case at the time of paralysis.

That alpha-tocopherol prevents the impairment and death of these suckling young has been securely established first by Barrie (1938) in England, then by Goettsch and Ritzman (1939) at

[1] Read before the General Session, American Dietetic Association, Los Angeles, August 29, 1939.

New York, and we have abundantly confirmed this at Berkeley. Goettsch and Ritzman gave a total of 5 mg. of alpha-tocopherol to each suckling young between the tenth and twenty-fifth day of life. We have given 1 mg. daily in the same interval and have never had paralysis or death supervene in such sucklings. But it is easier and just as reliable to treat the young by way of the mother so that her milk contains the substance, for the disease is invariably prevented when the mother is given a single dose of 6 mg. of alpha-tocopherol on the day of littering.

As a matter of fact, the lesions of the striated musculature were not first produced in rats, but in rabbits and guinea-pigs deprived of vitamin E, and we can now say that when care is taken to ensure that adequate amounts of the vitamin B complex are coincidentally present, alpha-tocopherol acts in the case of these animal forms also to cure or prevent paralysis and death (Mackenzie and McCollum, 1939; Shimotori, *et al.* 1939).

In 1931, Goettsch and Pappenheimer, who were interested in the production of vitamin E deficiency in a species other than the rat, found that rabbits and guinea-pigs reared on a diet in which the vitamin E had been destroyed by treatment with ferric chloride, developed a deficiency disease characterized by dystrophy of the voluntary muscles. In these early experiments the addition of wheat germ oil to the diet delayed the onset of the dystrophy but did not appear to prevent it, although Mattill subsequently found that the inclusion of 2 per cent wheat germ oil was at least adequate to prevent the development of dystrophy in rabbits for many months, during which time the animals grew normally.

Morgulis and co-workers found that at least two factors, both present in whole wheat germ, were required for the prevention or cure of the disease. One factor was soluble in 70 per cent ethanol and the other in typical fat solvents. The latter factor was present in the unsaponifiable fraction of wheat germ oil and was in all probability vitamin E. The most recent development here seems decisive, for it was with the Goettsch and Pappenheimer diet supplemented with 10 per cent ether-extracted wheat germ that Mackenzie and McCollum, employing rabbits, have been able to note the curative effect of alpha-tocopherol in connection with this experimental muscular dystrophy. A decrease in muscle creatine is invariable in dystrophic animals and there is always a corresponding increase in urinary creatine. This led Mackenzie and McCollum to devise an ingenious method for predicting the onset of the dystrophy. Vitamin E therapy in this way could be initiated a few hours before obvious paralysis would otherwise appear.

Madsen, McCay, and Maynard at Ithaca, in devising a purified diet for guinea-pigs and rabbits, found that when cod liver oil was included in the ration these animals succumbed to a muscular dystrophy. When the unsaponified fraction of cod liver oil was given in place of the oil itself the dystrophy was not prevented although its onset was delayed. Likewise the omission of cod liver oil and the use of irradiated yeast and carotene as sources of vitamins A and D did not prevent the eventual development of muscular lesions although the onset was delayed. Madsen,

McCay and Maynard believed that cod liver oil, particularly its saponifiable fraction, contained some toxic factor hastening the degeneration of the skeletal musculature but that a second factor must be admitted to be involved in the trouble. It is of particular interest that Miss Shimotori, in our laboratory, was able to prevent the dystrophy by administering alpha-tocopherol to guinea-pigs reared on the Madsen, McCay and Maynard diet, the alpha-tocopherol and cod liver oil being administered on alternate days. Mattill has shown that rabbits, reared on a synthetic diet containing no sources of vitamin E but supplied with a sufficient antioxidant, develop the muscular dystrophy and succumb as if on the basal diet.

It is highly interesting that characteristic disturbances and death occur in birds when the attempt is made to rear them without vitamin E. We owe our knowledge of these conditions almost exclusively to the Goettsch and Pappenheimer school. They have shown that chicks deprived of E develop a disorder called by them encephalomalacia, goslings a degeneration of the skeletal musculature, and turkeys an idiopathic degeneration of the smooth musculature of the gizzard. Dam of Copenhagen was the first to show the prevention of chick encephalomalacia with alpha-tocopherol. Pappenheimer's studies indicate that the involvement of the nervous system of chicks from lack of E is secondary to an impairment of the blood vessels supplying the brain. It is the first report of the degeneration of the walls of vascular trunks due to deficient E. The achievement of Dam in preventing encephalomalacia has recently been confirmed by Pappenheimer, Goettsch, and Junghahr.

It is evident, therefore, that a characteristic muscular atrophy and somewhat obscure fatality occur in widely divergent animal forms when vitamin E is withdrawn and that normality is assured with the same diets providing the pure substance, alpha-tocopherol, is administered prophylactically. There are probably manifold slighter deficiencies of the body when inadequate amounts of the vitamin are given even though these amounts are sufficient to

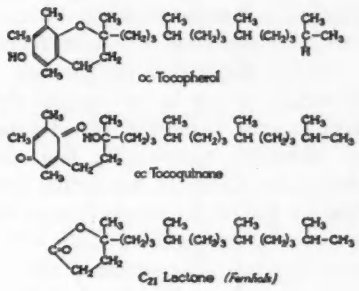


CHART 1

prevent muscular atrophy. A good example is furnished by the decline in the growth of E-low rats after the fourth month of life—a condition promptly relieved by the administration of vitamin E.

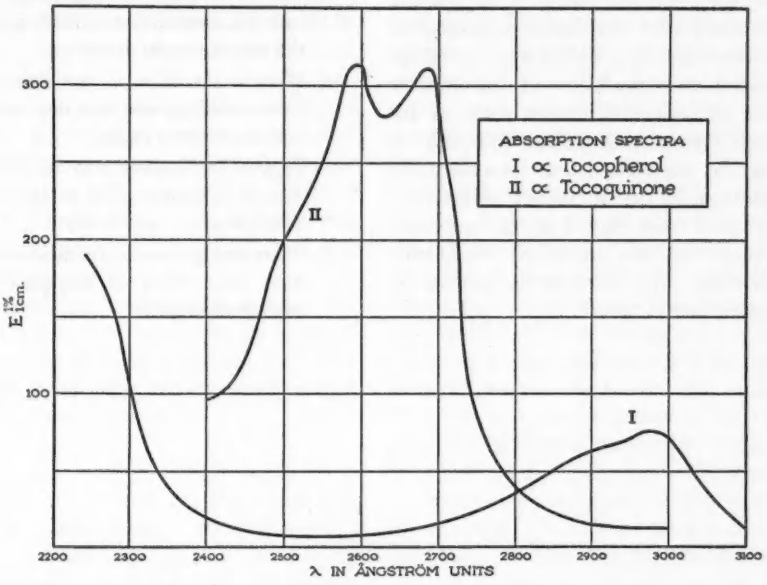
With the isolation of alpha- and beta-tocopherol and the synthetic production of these two pure substances, our concept of their chemical nature is almost complete, for in the case of alpha, in highest probability, it is the chromane substance of the above formula first proposed by Fernholtz.

John of Goettingen and we, independently at Berkeley in conjunction with L. I. Smith of Minnesota, have found a certain degree of vitamin E activity in an astonishing range of substances. Von Werder and Moll in Germany and Todd and associates in England have also extended the list and range of these substances. If, in fact, one feeds very high levels of the aromatic nucleus of tocopherol, in the form of tetramethyl hydroquinone, the fertility of sterile females can be reinvoked with single doses of 100 mg. This high melting and relatively insoluble substance is probably poorly absorbed, otherwise it might be even more effective than we have found. Karrer has shown that the presence of the methyl groups in the benzene ring plays a very important rôle because the dimethyl tocopherols, *beta* and *gamma*, are distinctly less active than alpha-tocopherol; Karrer synthesized the mono-methyl tocopherols and found them inactive. The nature of the aliphatic part of the tocopherol molecule is also important but here it is very hard to make any simple generalization of the relation of structure to vitamin activity, since, as already mentioned, duro-hydroquinone which has no long side chain whatever, nevertheless shows considerable activity, and many substances having side chains which approximate that of the tocopherols have no activity. It is hardly necessary to remind you of the analogous situation furnished by vitamin D. Calciferol, in the rat at least, possesses enormous vitamin D activity, yet the replacement of a hydrogen by a methyl group in the side chain gives a compound which Windaus found completely inactive. On the other hand, the vitamin D_3, which is a natural substance occurring in fish liver oils and is also an irradiation product of dehydrocholesterol, is extremely active, although its side chain differs in several respects from that of calciferol. Bills and Hickman have brought forth evidence to show that there is a potent vitamin D in fish liver oils with a very much shorter side-chain than any of the before-mentioned compounds.

Alpha-tocopherol can be oxidized to varying degrees by various procedures. The mildest oxidation, that accomplished by controlled action of $FeCl_3$ opens the ring giving the paraquinone as shown by John. A somewhat more drastic oxidizing agent, dilute nitric acid, oxidizes tocopherol to an intensely red substance of unknown structure and function. More drastic oxidation with permanganate or chrome acid shatters the aromatic ring giving a lactone which includes merely the aliphatic part of the molecule. Windaus believed that the biological rôle of vitamin E might be explained by its action as an oxidizing-reducing system, of which a number of analogous examples exist among biologically important substances such as ascorbic acid and glutathione. He pictured the tocopherol being oxidized to the quinone and then reduced back to the tocopherol. Whether this concept is true or not remains for future work to show. Several investigators have shown that the quinone can readily be reduced to a hydroxyquinone which can lose water to give tocopherol itself. This loss of water can be effected very rapidly by the catalytic action of strong acids but this is unfortunately not a physiological condition. Without the

presence of acids the hydroquinone can be distilled in high vacuum unchanged. According to our experiences the tocoquinone is about as active as alpha-tocopherol.

Now is perhaps the time to poise the basic question of whether or not that particular part of the molecule of alpha-tocopherol responsible for the cure of female sterility is the same chemical configuration responsible for the prevention or cure of the pathological conditions in the nervous and muscular systems already described. Waddell and Steenbock some years ago introduced an ingenious method for the destruction of vitamin E in natural foods. An etherial solution of ferric chloride was sprayed upon and thoroughly mixed with the food, sterility resulting in male rats from such a diet. The action of $FeCl_3$ in the destruction of E has been interpreted as a catalytic hastening of atmospheric oxidation. It is in fact possible in this way to decrease or destroy vitamin E in the highest known natural source of it, that is, wheat germ, for the oil subsequently extracted from such germ does not invoke fertility at 20 gm. doses whereas otherwise a gram is invariably efficacious. Such wheat germ oil thus enormously reduced in its fertility-conferring power is nevertheless effective in the prevention of the muscular dystrophy of suckling young rats when fed from the tenth day on (Goettsch and Ritzman). We had a somewhat parallel experience in the restoration of normal growth to E-low females characteristically slowed at the fifth month. We had permitted ferric chloride to act on wheat germ oil and had destroyed at least nine-tenths of its fertility-conferring power but not its power to promote growth. The above experiments



bring up the question of whether the same chemical configuration in alpha-tocopherol is needed for the normality of both growing embryos and the post-natal development of the muscular and nervous systems, very considerably lower levels sufficing for the last-mentioned requirements, or whether actually different portions of the tocopherol molecule are involved.

A settlement of this question has not yet been effected but may be reached by comparing the kinds of biological efficacy unfolded by various oxidative degradation products of tocopherol. The quinone still retains most of its fertility-conferring power although it may be emphasized that its absorption spectrum in the ultraviolet differs considerably from that of alpha-tocopherol typical for the unaltered tocopherol molecule. We are now in process of testing the lactone.

We may summarize the problems I have sought to bring before you as follows:

(1) What is the "specificity" of chemical structure in vitamin E responses, and are different chemical portions of the tocopherol molecule necessary for reproductive and neuromuscular normality?

(2) What is the actual mode of action of the vitamin in the physiology of embryos, seminiferous epithelium and the neuromuscular apparatus?

(3) What is the cause of the death of E-free sucklings and how does spontaneous recovery ensue?

(4) To what is the queer behavior of cod liver oil in hastening the paralysis to be attributed? and finally,

(5) What analogous human clinical conditions exist either of myogenic or neurogenic origin?

RECENT VITAMIN RESEARCH: I. VITAMINS A, D, E[1]

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THE excellent summary of progress in the vitamin field sponsored by the *Journal of the American Medical Association* in a recent series of articles, makes it apparent that a similar, though less ambitious effort, might be put forth to good advantage especially for those whose concern it is to make practical application of the discoveries in the field of biochemistry and experimental nutrition. Information pertaining to human requirements for and the distribution of the vitamins will not be included since these aspects of the subject have been considered in recent issues of this JOURNAL (1, 2).

Gratifying progress in vitamin research has been made in the fields of their chemical composition and synthesis, their physiological rôles and their clinical uses.

VITAMIN A

The early work of McCollum and Osborne and Mendel revealed vitamin A as a factor necessary for growth and the prevention of a specific eye disease. Subsequently other functions were ascribed to it. In 1922 Mori (3) noted that not only was the cornea involved in a process of drying and desquamation in vitamin A deficiency, but that the glands of the eyes and the mouth were also similarly affected. The work of several investigators showed clearly an increased incidence of infection in animals and in man maintained for any length of time on diets low in vitamin A.

Impairment of reproductive function in experimental animals of both sexes was one of the earlier observations on vitamin A deficiency. In fact some workers maintain that changes in the vaginal mucosa constitute the first and most delicate symptom of vitamin A depletion.

Wolbach (4) was the first to point out that most of the abnormalities accompanying vitamin A deficiency are referable to the damage to epithelial structures.[2] Interference with the normal function of these tissues may cause infections of the respiratory and genitourinary tracts, visual defects, skin blemishes and other injuries, all associated with changes in the epithelial cells.

At present the chief emphasis is upon the effect of slight degrees of deficiency upon vision. According to the comprehensive studies of Wald (5) and Hecht and his associates (6), vitamin A is combined with a protein in the retina, forming thereby visual purple which has an important rôle in the visual mechanism, particularly in visual acuity. When the bodily stores of the vitamin

[1] Received for publication September 27, 1939. "II. Vitamins C, B Complex and The Less Well Known Vitamin Factors," will appear in this JOURNAL for January 1940.

[2] A medical dictionary defines epithelium as "A term applied to the cells that form the epidermis (the outer layer of the skin), that line all canals having communication with the external air, and that are specialized for secretion in certain glands, as the liver, kidneys, etc."

are depleted, visual purple is not regenerated. This is characterized by defective vision in dim light. Hence the disturbance is called "night blindness." Jeans and Zentmire (7) proposed that the ability of the eyes to adapt themselves to dim light might be used as a means of estimating the nutritional status with respect to vitamin A. This method has been used by various workers but, as would be expected from such a subjective test, the results are not infallible.

Another manifestation of A deficiency is seen in the skin. Some workers are of the opinion that dryness of the skin precedes the eye changes by several weeks. The sebaceous and sweat glands, hair and nails are also affected.

Many workers have reported the finding of urinary calculi in rats deficient in vitamin A. Higgins (8) found urinary calculi in 85 per cent of A-deficient rats which survived 250 days. Only the etiology of phosphate stones is suggested in relation to avitaminosis A. From the studies of O'Conor (9), however, it appears that deficiency of this vitamin is significant in promoting the formation of calcium carbonate stones, especially in subjects restricted to alkaline diets for therapeutic purposes. He states that recurrence of these stones is frequently prevented by a diet rich in vitamin A. However, a survey of the literature reveals a long list of possible causes of urolithiasis; most investigators believe that vitamin A deficiency is but one of them.

The early literature records symptoms of muscular incoordination and degenerative changes in the nervous system in swine which could be cured by feeding butterfat. Similar results in other mammals and fowl have been reported more recently. However, failure to observe nerve lesions or to find degeneration of myelin sheaths in vitamin A-deficient animals is recorded by an impressive number of workers. Bessey and Wolbach (10), in speaking of the earlier work of Wolbach and Howe on the pathology of A deficiency, state: "A review of their records shows that a few rats, shortly before death, showed extreme muscular weakness and did drag their hind legs. This was attributed to extreme degeneration of the muscles." More recent studies from the laboratories of these investigators have failed to show degeneration of myelin in the spinal cord or peripheral nerves in rats and guinea-pigs which had exhibited extreme keratinizing metaplasia of epithelia characteristic of vitamin A deficiency. Bessey and Wolbach point out that degeneration of the myelin sheath is neither as specific a consequence nor as constant an accompaniment of vitamin A deficiency as is keratinization and metaplasia of epithelial tissues.

The foregoing offers convincing evidence that curtailment of the normal functioning of epithelial structures in large measure accounts for the commonly observed symptoms of avitaminosis A. Attention may also be directed to changes in the teeth and bone tissues and blood forming system. Marked changes occur in the bones of animals maintained on A-deficient diets. The bones become fragile and rarified and increasingly susceptible to fracture. Avitaminosis A causes atrophy of the enamel-forming organs of the teeth with consequent formation of thin and poorly-developed enamel. Decrease in the red

cell count and hemoglobin have also been reported.

The literature on the relation of vitamin A deficiency to susceptibility to infection is extensive and conflicting. Experiments with animals receiving vitamin A in their diets point generally to their increased resistance upon exposure to infection with certain pathogenic organisms.

Clinical findings are conflicting and impossible to evaluate. Intake of the vitamin was not definitely established and the nutritional condition of the cases studied was extremely varied. Investigations indicate that vitamin A is anti-infective merely in the sense that it is essential for the preservation of the epithelial structures which in turn constitute the first barrier to invading organisms. Vitamin A does not effect general immunity. The various experiments indicate that there is no basis for the belief that vitamin A therapy is effective clinically in infections caused by specific highly pathogenic organisms. Also it is of no value in infectious diseases which are unassociated with the characteristic structural breakdown of epithelial tissues, and the accompanying localized infection typical of vitamin A deficiency.

Twenty years ago Steenbock (11) called attention to the close relationship between yellow pigment in foods and their vitamin A effect. The validity of his conclusions was challenged and not until some years later was it established that the three forms of carotene and cryptoxanthine are actually provitamin A and are converted into the latter in the liver.

The process of digestion is not a requisite for absorption and utilization of vitamin A, but the degree of absorption is widely different for carotene and the vitamin, and varies with intake, manner of administration, and health of the alimentary tract. Assimilation of carotene is variable and under normal circumstances it is less efficient than that of the vitamin. When administered in small quantities, under ordinary conditions, it is utilized to the extent of about 80 per cent. Larger quantities are not so well utilized as vitamin A, particularly if the carotene is fed without being dissolved in oil.

Bile is not necessary for the absorption of vitamin A from the gastro-intestinal tract of the rat but is essential to the utilization of carotene given by mouth. Hence it is clear why adequate dietary intake of this vitamin is not always sufficient and why secondary cases of avitaminosis A are recorded in the literature, due to deficient absorption of this substance.

Vitamin A has been isolated in crystalline form and has also been synthesized. Evidence has been presented indicating the existence in fresh water fishes of a second form of vitamin A called A_2, a discovery too recent to justify further discussion.

VITAMIN D

Cod liver oil was employed specifically in the treatment of rickets for almost a century before the nature of its efficacy was understood. This understanding was due largely to the production of experimental rickets in rats and dogs and the observation that the content and ratios of calcium and phosphorus in the diet, together with the presence or absence of some organic factor in cod liver oil, were the essential factors

in the production of experimental rickets. Next came the observation of the antiricketic action of sunlight and ultraviolet rays and ultimately the discovery that ergosterol is provitamin D, which upon exposure to sunlight or ultraviolet rays is converted into the vitamin itself.

Notwithstanding the apparent proof that ergosterol is a constant contaminant of ordinary cholesterol and is a form of provitamin D, it is not the only source of this vitamin associated with cholesterol nor is irradiation with ultraviolet light the only means of forming vitamin D from its precursors. In 1930 Mussehl and Ackerson (12) reported that amounts of irradiated yeast and irradiated ergosterol which, calculated on the basis of bioassays on ricketic rats, were equivalent to from 10 to 50 per cent of cod liver oil in the diet, failed to prevent leg weakness in chicks. Massengale and Nussmeier (13) found that it was necessary to administer the equivalent of 200 per cent of cod liver oil in the form of irradiated ergosterol to produce in chicks the effect secured by 2 per cent cod liver oil. Other workers secured similar results. Bethke, Record and Kennard (14) made a critical study of the comparative antiricketic values of these two sources of vitamin D, and found that it required 15 to 20 times as many rat units of vitamin D in the form of irradiated ergosterol as of cod liver oil to ensure normal bone formation in chicks.

Employing this new method of comparative assays with rats and chicks, Waddell (15) tested irradiated cholesterol as a rickets-preventive for chicks, and demonstrated that it is more effective than an equivalent number of rat units of irradiated ergosterol. Irradiated cholesterol, he found, is at least as effective as the vitamin D of cod liver oil, hence the provitamin, which had been presumed to be ergosterol, is actually another substance; 7-dihydrocholesterol appears to be the principal activatable sterol or provitamin D in ordinary cholesterol. This form is the most important naturally-occurring one and is known as D_3. It appears that the provitamin in skin, feathers, wool, etc., is 7-dihydrocholesterol and that the antiricketic effect of ultraviolet rays of sunlight is due to the activation of this sterol. It is the form present in irradiated foods of animal origin, including milk.

The properties of vitamin D are exhibited by at least eleven different sterol derivatives. The irradiation of ergosterol results in the formation of a number of separate compounds. The term D_1 was given to the first antiricketic substance isolated from irradiated ergosterol. But this D_1 was later shown to consist of a molecular compound of vitamin D with a second irradiation product called lumisterol. The molecular compound of vitamin D was called calciferol and is now also known as vitamin D_2, the term D_1 having been discarded. As mentioned in the preceding paragraph, activated 7-dihydrocholesterol is vitamin D_3, and D_4 is activated 22-dihydrocalciferol. D_4 is the form found in irradiated vegetable foods, except in yeast and other fungi, which may be present in certain foods, and which because they contain ergosterol, would contribute vitamin D_2 on irradiation.

The question arises as to whether the human reaction to the different antiricketic substances is like that of the

rat or like that of the chicken. The evidence at present available, while not conclusive, is at least indicative that, rat unit for rat unit, the various forms of vitamin D have equal value for humans.

Vitamin D has a striking regulatory power on the metabolism of calcium and phosphorus. It acts not only as a regulator of the metabolism of these elements but it permits the body to use them with greatly increased economy. When vitamin D is present in optimum amount, the metabolism of calcium and phosphorus is maintained in a nearly normal manner even when one or both of them is provided at almost starvation levels. The vitamin brings about maximal utilization of calcium and phosphorus under these conditions, both by reducing excretion and by increasing absorption.

Vitamin D deficiency produces, among other effects, a fall in available calcium in the blood serum. Blood calcium concentration is controlled in part by the parathyroid hormone, and in avitaminosis D there is a compensatory enlargement of the parathyroid glands to offset the deficiency of the nutrient. Wilder and Howell (16) point out that hyperparathyroidism is exceedingly rare in sunny climates, and occurs with increasing frequency at higher latitudes. They correlate this incidence with the amount of sunlight available. In the North Atlantic states 113 cases have been reported per 100,000 of population, as against 9.5 cases in Italy. The evidence seems conclusive that deficiency of vitamin D demands compensatory hormonal production by the parathyroids.

Tetany and osteomalacia are accompanied by a fall in the level of blood calcium. In both diseases beneficial results are achieved by the administration of vitamin D in some form. Celiac disease is frequently followed by rickets, osteoporosis and tetany, and when vitamin D therapy has been employed marked improvement has been reported. Vitamin D has been observed to exert a healing effect in the delayed or imperfect union of fractures in old people and children. In surgical procedures of gallbladder disorders, delayed clotting of the blood is a frequent accompaniment, and vitamin D therapy is often of help. But here as in the treatment of arthritis, hay. fever and psoriasis with massive doses of vitamin D, where clinical improvement does occur, the mechanism of improvement is not yet understood.

Among metabolic processes other than those involved in the prevention of rickets and regulation of calcium and phosphorus metabolism, vitamin D is concerned with energy metabolism.

A number of investigations have suggested a relation between antiricketic substances and the body's rate of gaseous exchange. Nitschke (17) has pointed out that the basal metabolic rate may be considerably below normal in ricketic infants and rats, and that the rate is increased by vitamin D therapy. Administration of the vitamin to hedge hogs prevented hibernation, a condition in which there is a depression in metabolism. Reed (18) and Dreyer and Reed (19) and Rappaport and collaborators (20) have shown that massive doses of vitamin D considerably increase the metabolic rate of normal dogs and rats.

Evidence exists showing that the muscular weakness which often accom-

panies rickets is due to inadequate production of hexose phosphate and disturbed carbohydrate metabolism. Hentschel and Zöller (21) found that the inorganic and organic phosphate content of the muscles was considerably reduced in rickets, and that in active rickets the ability to synthesize hexose phosphate is greatly impaired. Landsberger and Silber (22) found in florid rickets reduced carbohydrate tolerance and a hyperglycemic curve that was not counteracted by insulin.

Vitamin D deficiency apparently does not directly affect blood regenerating capacity of the body. However, H. Day and Stein (23), working with rats, have noted that a deficiency of vitamin D in diets containing an excess of phosphorus, relative or absolute, causes a greater degree of anemia than occurs with similar diets adequate in vitamin D.

The relation of diet to tooth development and tooth preservation is not as yet entirely clear. The enamel and dentine of teeth consist principally of calcium and phosphorus and since vitamin D plays so important a rôle in the metabolism of these two inorganic elements it is obviously a factor of great importance to the health of the teeth. May Mellanby (24) studied children in three institutions at Sheffield and Birmingham to determine the effect of a supplement of vitamin D on the incidence of tooth decay. Her results show that the percentage of caries in these children was lowest when cod liver oil was added as a supplement and highest when a sugar supplement, as syrup, replaced cod liver oil.

McBeath and Zucker (25) reported an investigation of over 800 children, most of whom were under observation during four years, to determine the influence of a supplement of vitamin D on the incidence of dental caries. Their data clearly show that dental caries is seasonal, the highest incidence being in late winter and early spring and lowest during the summer. Their study points to the beneficial effects of vitamin D in preventing caries. The administration of graded amounts of vitamin D in the form of vitamin D milk resulted in graded caries prevention. Of the three levels given (250, 400, and 800 I. U. daily) only the last named was adequate to prevent an increase during the height of the caries season above that of the previous period. These investigators also found that irradiation of children with ultraviolet light had a favorable effect in reducing the incidence of caries. This is in accord with the lower incidence during summer.

McCollum (26) says:

> Due to the fact that in temperate regions almost all foodstuffs are deficient or lacking in vitamin D, and until the past fifteen years adequate supplements of this vitamin were generally not provided to infants, children, and pregnant and lactating women, and the prevalence of rickets was widespread, it is evident that deficiency of vitamin D must have had an unfavorable effect upon the structure of the teeth. Because defective enamel predisposes teeth to decay, this deficiency must have contributed to the high incidence of dental caries of persons who passed through infancy in the pre-vitamin D days.
>
> Since sunlight containing an adequate amount of ultraviolet rays, acting upon the skin, is a source of vitamin D, dental caries would be expected to occur more frequently in

children in the northern states than farther south. Of interest in this connection is a survey begun in 1933 under the auspices of the American Dental Association, in which 8000 dentists in 26 states collaborated, and in which over 1,400,000 children were examined, representing 11.6 per cent of the estimated number of children 6–14 years of age in the areas studied. The results were published in 1936 by the U. S. Public Health Service. In the southern states 60 per cent of the children had caries of the permanent teeth, whereas in the northern states the percentage was 76. In the South the number of cavities per 100 children was 202; in the northern states the figure was 293. In searching for the cause or causes of this difference in incidence of dental caries, one may postulate that the diet, in one or more respects, is inferior in the northern states to that in the South. In the absence of more detailed data this factor cannot be evaluated. It seems logical to attribute the difference in incidence of tooth decay, in some measure at least, to deficiency of effective sunshine in the North.

Occasionally the question of the toxic effects of overdosage of vitamin D arises. It is now clear that, contrary to former belief, irradiated ergosterol (calciferol) is not a toxic substance. The toxicity manifested by former preparations was due not to vitamin D but to other substances which developed as a result of the solvents and methods of irradiation then employed. The present-day method of irradiating ergosterol avoids the formation of toxic products. Bills (27) states: "It is characteristic of vitamin D that the range between its ordinary therapeutic dose and the dose which produces adverse symptoms is extraordinarily wide; wider perhaps than is the case with any other potent drug."

VITAMIN E

Evidence of the existence of a vitamin concerned specifically with reproduction in rats was first presented by Mattill and Conklin (28) in 1920. Two years later Evans and Bishop (29) presented experimental evidence of the existence of a dietary factor essential for reproduction which subsequently was called vitamin E.

Vitamin E deficiency produces different effects in female and male rats. Females exhibit normal estrus cycles, breed, ovulate and conceive but fail to carry their young to term. Abnormalities in the developing embryos appear about the eighth day of pregnancy. Administration of vitamin E as late as the fifth day after copulation results in a normal pregnancy. It is the fetal rather than the maternal tissues that are damaged by E deficiency.

In the male there is progressive loss of germinal epithelium in the testicular tubules and ultimately irreparable damage to the basal spermatogonia, the precursor of the mature motile spermatozoa. Eventually only degenerated tubules remain. Such males still possess normal seminal vesicles, prostate, and coagulating glands, and although their germinal epithelium has largely disappeared, continue for a considerable time to manifest sex interest and power to copulate. Later these sterile males suffer degeneration of the accessory organs and sex interest wanes. Even when vitamin E is administered at the time of the earliest signs of impairment of spermatozoa, only a few can be restored to fertility. Before these signs have ap-

peared sterility can be invariably prevented by the provision of vitamin E.

Evans points out that for the insurance of fertility throughout life in males a higher daily inflow of E is essential than for gestation alone. Thus, as pointed out by Mattill (30), "The striking difference in response to vitamin E deprivation by male and female animals can be explained, superficially, by the fact that in the male the damage is done to a part of the animal's own tissue and may for this reason be irreversible in contrast to the reparable damage in the female, which is wrought not on her own tissues but on those of the fetus."

In hens vitamin E deficiency is said to produce reduction in hatchability of the eggs and a decrease in the vitality of chicks that are hatched (31, 32, 33).

There have been several reports that wheat germ oil or other rich sources of vitamin E are efficacious in some cases of sterility. Schioppa (34) has stated that large doses of wheat germ oil increase the size of rabbit litters. Bay and Vogt-Møller (35) have claimed that the injection of sterilized wheat germ oil into apparently sterile, but otherwise normal cows and sows permitted reproduction in a majority of instances.

Several clinical reports have appeared which suggest that wheat germ oil is of value in preventing spontaneous human abortions. Lack of adequate control makes these data unconvincing. Vogt-Møller (36) has published the results of several studies in which wheat germ oil treatment apparently caused normal pregnancies which otherwise would have terminated in abortion. Structural or functional abnormalities were ruled out as possible causes of previous reproductive failures. In a study by Currie (37), the use of an unsaponifiable wheat germ oil fraction was followed by 31 full term deliveries in 37 women who had previously aborted. By similar treatment he had success in 14 of 15 cases of threatened abortion. Other clinical investigators have reported similar results but because of the obvious difficulties involved in the study of human sterility it is too early to state definitely the rôle of vitamin E in this connection.

For several years it was accepted that vitamin E was concerned specifically and exclusively with reproduction but during the past decade evidence slowly accumulated which proves that this nutrient is indispensable in general bodily functions. Evans (38) noted that vitamin E deficiency caused a failure in the late stages of growth. Blumberg (39) and Martin (40), by means of a highly refined basal ration, observed an earlier failure in growth and also marked generalized debilitation. Evans, Emerson and Emerson (41) have stimulated growth in female rats by means of pure vitamin E, α-tocopherol, fed to animals for 50 days after they had plateaued in weight on a vitamin E-low diet.

Paralysis as a result of vitamin E deficiency has been reported in both young and mature rats. Evans and Burr (42) showed that young rats born of females on a vitamin E-low diet exhibited a marked paralysis, especially of the hind quarters, about 20 days after birth. Blumberg (l.c.) noted marked stiffness and evidences of muscular disturbance in female rats restricted to a vitamin E-deficient diet for periods of 30 to 40 weeks. The animals could be cured by administration of vitamin E concentrates whereas the paralysis in

the young animals described above is irreparable. A concentrate of vitamin E and the vitamin in pure form have been shown by Morgulis and others (43) to be effective in the cure of muscular dystrophy in rats, rabbits and guinea-pigs restricted to experimental diets.

Changes in the pituitary and thyroid glands of rats on diets low in vitamin E have been described. The changes produced in the pituitary gland of the male rat deprived of vitamin E are similar to those occurring where the testes fail to descend into the scrotum (44).

Singer (45) states that the thyroid glands of female rats deprived of E for 12 to 18 months show marked underdevelopment. The condition did not respond to the administration of iodine but injections of an extract of the pituitary gland caused some improvement and the thyroid became normal when vitamin E was administered. It is suggested that E deficiency indirectly affects the thyroid through its influence on the anterior portion of the pituitary gland.

For some years the idea has prevailed that there is a relationship between E and tumor formation. Results recorded are in conflict. Some claim that vitamin E in abundance inhibits the proliferation of cancerous cells. Rowntree and associates (46) claim that excessive and prolonged feeding of certain types of wheat germ oil, particularly unrefined oil obtained by ether extraction, produced a high incidence of a specific type of sarcoma in rats on stock diet. Similar procedure by other workers failed to corroborate the findings of Rowntree.

It is interesting to note that the chemical structure of vitamin E has been determined (47) and that synthetic compounds have been shown to have the same potency as the vitamin from natural sources (48). The name α-tocopherol has been applied to vitamin E (*Tokos:* childbirth; *phero:* to bear; *ol*, indicating an alcohol).

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INTERNATIONAL AND NATIONAL ASPECTS OF THE CAMPAIGN FOR BETTER NUTRITION[1]

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The Age of Paradoxes. We live in the age of paradoxes. Progress in the natural sciences has far outstripped advances in the social sciences. The new knowledge of natural science provides powerful weapons which are used to make war more terrible than ever before in history. But science has not yet taught us how to avoid war. Governments which do not want war find themselves being dragged into war by forces which they have not learned to resist. Some of the most peace-loving peoples have resigned themselves to the thought that war is inevitable. The fear of war, and some of the measures taken to avoid it, have brought about in certain countries conditions so terrible that they resemble in many respects the worst results of war.

On the other hand the world in which we live has been transformed in the last hundred years by the advances of science. The toll of infectious diseases is decreasing so rapidly that we can look forward with assurance to their practical extinction. Within less than a century man has nearly doubled his own average span of life. Space and time are being conquered by advances in communication and transportation. As I write, regular air mail services are being established between Europe and the two Americas, and in the quiet of our homes we can hear voices from the most remote places on the earth. Science has made the human race into one big family, yet man has so complicated his social and international relationships that his present desperate concern is to prevent revolution and to avoid war.

Within the last quarter of a century we have witnessed the development of the strangest paradox of all—that of people going hungry while the earth was producing too much to eat. During my travels I have heard of gluts of wheat, potatoes, coffee, rubber, and quinine, while I have been confronted with evidence of the direst need for these very products. Natural science has multiplied our production so that we can easily produce an abundance of everything we need to feed, clothe and shelter every individual in the whole world.

Yet millions are insufficiently or improperly fed, clothed and sheltered, while other millions are unemployed. Millions need shoes while hundreds of shoe factories stand idle. Millions need clothing while cotton cannot find a market and the wheels of textile factories stand idle. Coffee, wheat, cotton, potatoes, citrus fruits and other commodities are burned or destroyed or denatured while millions use coffee substitutes, or adulterated bread, and millions suffer from nutritional deficiencies for lack of the foods which are a glut on the market.

The Clash of Ideologies. These are the visible signs of disease deep down

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in our civilization. The symptoms are the political tensions which are disturbing the world today. The clash of alien ideologies of which we hear so much is but the surf of a wave which is moving silently and strongly beneath the surface. Old landmarks are being swept away; the landscape has an unfamiliar aspect. We are trying to escape from the old world which is disappearing beneath our feet, and no one has built a bridge for us to the new world of which we can see the dim outlines in the distance. It is the task of this generation to build that bridge, and it is our duty to carry over it into the new world as many of our most precious possessions as possible, in the form of liberty, freedom of speech and assembly, the free exercise of private initiative, the sturdy spirit of self-reliance and independence, and above all, social justice.

When we begin to analyze the political tensions and conflicts, we find that they are thought to be due to the material possessions, or lack of them, in the different nations. Countries are divided into those which have and those which have not. Certain countries have colonies, raw materials, land on which to raise food, and space in which to expand, while others are overpopulated, lacking in colonies and raw materials, with too little arable land on which to grow food crops. But this cannot be the whole answer because some of the richest countries have lacked these advantages and some of the poorest have had them. Moreover, many persons are underfed, underclad and inadequately sheltered in the countries possessing the greatest material advantages. During the period before the World War—the last half of the 19th and the first years of the 20th century—international trade progressed by leaps and bounds. There was a free exchange of goods between countries which were predominantly industrial and those which were mainly agricultural. England, which raises only a fraction of the food needed by her people, was one of the best fed countries in the world. After the war the situation changed. Suspicion regulated the relationships between governments. Industrial countries which did not raise sufficient food began to feel insecure. Agricultural countries which did not produce sufficient machinery began to feel uneasy. National self-sufficiency became the watchword. It was accompanied by the growth of nationalism which found expression in the revival of ancient languages and customs. Civilization was reverting to older and more primitive forms; the world which lived in the twentieth century, from the point of view of science, reverted to the dark ages from the point of view of social relationships and standards.

The Idiocy of National Self-Sufficiency. Let me draw you a true but somewhat over-simplified picture of a country which has adopted the national policy of self-sufficiency because of fear of her neighbors.

The first concern of the government is to arm, to raise a powerful army and to supply it with equipment. All this must be produced at home, for in time of war it may not be possible to import munitions. So new and artificial industries are created, and to protect these from foreign competition high tariffs are enforced. Neighboring countries promptly retaliate by countervailing tariffs, and the first gun in economic

warfare has been fired. Agriculture is an essential war industry and must be placed on a war footing. As the existing acreage is limited, those crops must be grown which produce most quickly the largest amounts of food. So pasture and orchard and market garden are transformed into fields of wheat, which cannot be raised so cheaply as on the great prairies of America, Canada, Australia, and Russia. To protect this new industry a high tariff is imposed on wheat, or the wheat farmer is subsidized. So bread becomes dearer, meat and milk products dearer and scarcer, and fruit almost disappears from the market. The taxes imposed to support new industries and the army and navy become increasingly heavy so that industrial workers find it more and more difficult to obtain proper food which has also increased so much in price. As the country lacks certain essential raw materials, it must obtain foreign currency to buy them by selling some of its own products abroad. But these products must compete in the world market and surmount the obstacle of high tariffs adopted by other countries either in retaliation or because they, too, seek to become self-sufficient. So industrial and farm products are dumped abroad at less than the cost of production, in order that raw materials for armaments may be obtained, while farmers who produce food must sell everything for which cash can be obtained to pay their heavy taxes. I know from observation that millions of peasant families are gravely undernourished in the midst of the plenty they produce. Millions of industrial workers are taxed so heavily and food is so dear that they cannot buy enough to nourish their families properly. Cash crops tend to impoverish the land and the policy of self-sufficiency impoverishes and undermines the health of the people. This is economic warfare at its worst, a war which bears most heavily on women and children, for the men who are conscripted to serve in the army obtain sufficient food at least during their service. Is it any wonder that chronic undernourishment, a constant lowering of the standard of living, the inability to provide for one's family, the frequent illness which always accompanies undernutrition, the low wages which are the necessary concomitant of a badly balanced economic system, should breed grumbling and discontent? Becoming aware of internal unrest, governments resort to the old cry, "Your enemies are beyond the frontiers. They are trying to starve you!" And such a people is easily led into war, welcoming any possibility of escape from the misery of economic warfare.

Need for a Rising Standard of Living. The most vicious forms of human depravity breed under the worst economic conditions. It was the terrible suffering of the French people which led to the excesses of the French Revolution and I could cite you some much more modern and not less striking examples.

The advance of science opens to us the opportunity of raising the standard of living to a higher level than it has ever attained in the history of mankind. What is the standard of living? I think we should restrict our definition to the essentials as long as millions of our fellow beings lack proper food or clothing or shelter. An adequate diet is certainly the most important element in the standard of living in view of the knowledge we have acquired of the new

science of nutrition. Examined from this point of view our own standard of living is far from satisfactory.

Evidences of Malnutrition in this Country. There has been a recent outbreak of scurvy in Maine. Of 4000 children under investigation, 2000 had received no milk for two years. Of 95 children of school age examined, 70 per cent had a lower than normal concentration of ascorbic acid in the blood; in 48 per cent it was very low indeed, less than 0.5 mg. per 100 cc. of plasma. A high percentage of infants admitted into the Toronto Hospital for Sick Children are found to have very low vitamin C values in the blood. Only 16 per cent of 155 children admitted had ascorbic acid levels believed to be consistent with good health. Nutritional edema, due to lack of sufficient protein in the diet, is found in 15 per cent of patients admitted to a large Georgia hospital, while 35 per cent of these patients have nutritional anemia. There were at least 100,000 cases of pellagra in the South during 1938, a disease which causes between three and four thousand deaths every year in this country. In Philadelphia, about 9 per cent of the school children examined annually are classified as having unsatisfactory nutrition, by methods which permit many to escape this classification (1). Dietary surveys furnish the clearest evidence of inadequate diets. Such a survey of low-income families in Toronto showed that on the average, the diets of the women and children were deficient in every important factor, including total calories. Why should the calories be deficient when bread and sugar are so cheap? Because these people are sick people, lacking normal appetites because of their poor diets. Fifty per cent of British youth volunteering for the army were rejected by the army physicians. Sir John Boyd Orr persuaded the army to take a random sample of 300 of those rejected, feed them nourishing food and reexamine them. At the end of six months 270 of the 300 were found to be fit enough to serve in the army. Hazel Stiebeling made a study of employed workers' families in the East, West, and South (2). Forty per cent had poor diets on the Pacific Coast, the percentage was 57 in North Atlantic cities and 46 among whites in the South. Among negroes in the South, 64 per cent had poor diets deficient in one or more essential elements. The Bureau of Home Economics, in trying to standardize the sizes of children's clothing, has found that children vary in size at the same ages according to these findings of the dietary survey.

We have considerable evidence of the existence of a comparatively large amount of gross malnutrition among our people but we have not probed very deep. According to one authority, malnutrition is like an iceberg; its greatest mass and its greatest danger lie beneath the surface. We are able to recognize frank scurvy, rickets, pellagra, beriberi, xerophthalmia, nutritional anemia and nutritional edema, but we have made few surveys to determine the vast amount of latent malnutrition which undermines health, influences susceptibility to disease and probably shortens life.

Malnutrition and Poverty. Malnutrition exists wherever poverty is found, for the nutritious elements are as a rule the expensive food elements; and malnutrition itself is a cause of poverty. Poverty is also associated with excessive

sickness and death rates. It is said that 15 per cent of the dependency in New York City is due to illness. Among wage earners the average number of days of disability per year decreases with increasing income; it is nearly nine days among workers earning less than $1,200 a year and not quite four among those who earn $3,000 and over. The infant death rate among Denver families earning less than $500 in 1931, was 160, while among families earning $3,000 or over it was 30. In Cleveland in 1928 the infant death rates were 100 in the poorer districts and 50 in the better economic areas. In 1930 the tuberculosis death rate among unskilled laborers was seven times the rate among professional men. I am not prepared to say that difference in diets is the only cause of the differences in these sickness and death rates but I am sure you will agree that it is an important cause. Moreover, you will never get to the bottom of the problem of the relationship between poverty and disease until you stabilize as many factors as possible in the environment, and of these diet is certainly one of the most if not the most important.

New Significance of Better Nutrition. The science of nutrition teaches us that greater benefits than the mere absence of nutritional deficiencies may result from an abundance of the protective foods in the diet. According to Sherman (3), "the liberal use of these foods has been found not only to forestall what are otherwise the most frequent deficiency conditions but also to diminish somewhat the incidence or severity or duration of some diseases other than those which are primarily nutritional." Wilder states, "the nutritional background and foundation afforded by the habitual use of a dietary which is thoroughly well-balanced, with reference to the newly-discovered as well as longer known factors, may greatly advance the probability of a satisfactory outcome of whatever medical measure is to be undertaken." McCollum first pointed out that there may be important differences between the passably adequate and the optimum in nutrition. Hopkins suggested that such differences may have far-reaching effects which have previously been attributed to racial factors. Sherman carried out experiments which apparently showed that the addition to the diet of protective foods, over and above the amounts required for normal reproduction and the maintenance of normal health and length of life in rats, will still further enhance the average of nutritional well-being, expediting growth and development, maintaining a higher level of adult nutrition and increasing by some ten per cent the life expectancy of both young and adult.

So rapidly is the new science of nutrition advancing that new facts concerning its importance are appearing almost daily. We are beginning to appreciate that the effects of nutritional deficiency are more serious and permanent than we had believed, and on the other hand, that the benefits of an abundantly adequate diet are greater than we had any reason to expect.

A well organized program of nutrition, reaching down to the people who need it most, should result in a levelling up of the sickness and death rates of the lower income groups to the standard of those with higher incomes. Would it not be wise to try this promising measure of prevention before sinking too much

capital into new institutions to care for the end products of malnutrition and disease? Even if the experiment does not bring all the benefits I have enumerated, is it not worth trying? Can any intelligent man or woman today find any excuse for burning, destroying or denaturing food, or even for restricting its production in the face of these facts? Is it possible to have a stable civilization when millions suffer from the lack of proper food while food supplies are destroyed? To ask these questions is to answer them, and to read the daily newspapers is to realize that our civilization is far from stable.

Better Nutrition and Agriculture. Having decided to launch our nutrition campaign, we must look into its effects on agriculture, which every government of every country likes to maintain in as stable and prosperous a condition as possible. Much of our land has been impoverished by farming methods. In the humid states of the North our soil has lost one-fourth of its original sulfur, one-fourth of its nitrates, one-fifth of its phosphates, one-tenth of its potassium. It is difficult to replace some of this mineral wealth. The farmer may replace the nitrates; he cannot afford to replace the phosphates. Mainly by intensified cash cropping, the land has been more or less permanently impoverished. Food products cannot be more nutritious than the soil from which they are produced, so our first care will be to build up and maintain the richness of our soil. Moreover, certain food products are more valuable when grown in one region than in others, so attempts will be made to grow food where it grows best, thus promoting a healthy interchange of farm products. To satisfy our peoples' needs we shall require a great deal more milk, cheese, butter, eggs, vegetables and fruit. These crops require more man power than the cash crops, and perhaps the new demands on our agriculture will require more men on the farms. At least economic pressure will not be so likely to drive our surplus youth from the rural districts, where birth rates are highest, to the great metropolitan areas. Some of the crops required for better nutrition will enrich the soil, and help to prevent land erosion while employing more people and promoting a more stable and contented farming class. Instead of subsidizing restriction we may have to subsidize consumption. The cost of the proper foods may be too high for the poorest consumers to pay. Would it not give one a deeper feeling of satisfaction to subsidize the farmer to raise more and better food and thus reduce the cost to the poor consumer, rather than pay the farmer to reduce production? If all the people were to have diets as adequate as are enjoyed at present by the higher income levels, more farm land would have to be put into production. More farmers would find work, more farm machinery would be needed, more food would pay freight, more grocers would reap profits, more red blood would flow through the veins and arteries of commerce. If all of our people were to receive enough calories, I doubt very much that we would have any wheat for export. Raising the level of the average diet only a little higher than it is at present would make an enormous difference to our agriculture, and would make its influence felt in every part of our economic system.

Better Nutrition and World Trade. If

a few countries decided to try the experiment together, there would be an enormous effect on world trade. Food would be purchased in the cheapest market instead of trying to produce it under unsuitable conditions. Wheat would come from its natural sources, the great prairies of America, Canada, Australia and Russia. Perishable foods would be raised locally. Industrial products would be exchanged for wheat and meat and fruit. There would be a revival of the world trade which flowed so freely before the war. Shipping would profit. The example set by a few countries would soon be followed by others, for there is nothing so contagious as a rising standard of living. And nothing more dangerous, I might add, to the stability of a régime which is not succeeding in giving its people the benefits of such a policy. I can think of no other method so likely to break the jam in the world economic system as the adoption of a national policy to supply adequate diets to all the people as rapidly as possible. It would be an attack on a vicious circle at its weakest point. It would rally to its banner all who have at heart the preservation of our free institutions and system of government.

The international campaign for better nutrition launched by the League of Nations and International Labor Office in 1935 is still making headway. It is concerned not only with the medical aspects but also with the economic, agricultural and social implications of better nutrition. National nutrition committees have been set up in twenty-two countries, and on two occasions representatives of these committees have met in Geneva to exchange views and experience. Under the stimulus of the League's work, dietary studies and appraisals of human nutrition have been undertaken in a number of countries. Tariff, agricultural and economic policies generally are being studied in their relation to the problem of human nutrition. While the influence of the League in the field of politics is at a low ebb, I have faith that its technical work at least will be kept alive until times are more favorable. No other work which the League and Labor Office have undertaken has appealed quite so much to the public imagination, and I am sure it will be maintained in spite of the dark political outlook.

Our Opportunity. In the meantime a great opportunity awaits us in this country. We need to know much more about the nutrition of our people than we know today. I feel sure that research laboratories will continue to pour out the multitude of observations needed to enlarge our knowledge of the science of nutrition. It is in applying the science that we have fallen behind. We have no such accurate knowledge concerning the problem of human nutrition as we need to wage an effective campaign. We require more carefully worked out dietary surveys to locate the undernourished and to show the public that a real problem exists. We need to work out a practical system of appraising human nutrition by using the new biochemical and physiological tests and perfecting them for mass use. Our doctors in training need better instruction in biochemistry and dietetics and our health officials require better courses in applied human nutrition. Public health nurses, too, need better training in nutrition. The subject needs to be integrated into the public health pro-

gram, and not left to the nutritionist alone. We need more and better nutritionists and dietitians and better support and understanding of their work. Our methods of nutrition education require testing to see if they are effective and economical.

It is my hope that our government may see fit to set up a national nutrition committee, composed of leaders in nutrition, agriculture, economics, transport, administration, marketing, labor, etc., which will set a high standard for the whole country, and coordinate our national policies to bring about better nutrition and a higher standard of living.

The Economist Considers Nutrition. I should like to quote, in closing, the words of three internationally known economists.

In his final speech at the World Economic Conference in 1927, Mr. Theunis, the president, said:

> No machinery for the settlement of international disputes can be relied upon to maintain peace if the economic policies of the world so develop as to create not only a deep divergence of economic interest between different masses of the world's population, but also a sense of intolerable injury and injustice.

Mr. Loveday, director of the League's Economic Organisation, said in a recent broadcast:

> The nutrition campaign seems to me to be of paramount importance not only on account of its immediate object, which is to improve the standard of living, but on account of the influence it is likely to have on our whole economic outlook. Ever since the time of Adam Smith, economic thought has centered around the art of production or the conditions of citizens as producers. The nutrition movement reflects the first serious endeavor, certainly on an international scale, to consider the economics, not of production but of consumption.
>
> The second point that I want to mention is somewhat similar. Economists have concentrated in the past on problems of production. Production of what? Production of an endless series of inanimate objects. Those concerned with this nutrition campaign say: No, what you should really try to produce first is the best possible human beings—the best possible citizens.

Mr. F. L. McDougall, economic adviser to the Australian government, states:

> The five aims of an improved level of nutrition, higher standards of living, a more prosperous world agriculture, freer international trade and an increased volume of trade, together interlock to form lines of policy which should ensure economic and political stability to the nations prepared for such cooperation, and if vigorously prosecuted should help to promote the peace so desirable but so difficult of achievement in the world today.

If we want a more stable society, a more prosperous economy, less drain on our resources due to needless sickness and death, less rapidly increasing expenditure for the weaker elements in our society, if we want to put a bottom under poverty and give children born into the world a greater measure of equality of opportunity, the first step is to ensure an adequate diet in the modern sense of the term for every man, woman and child. This is the true prevention.

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EDITORIAL

The Dietitian at the Microphone

The Rochester Dietetic Association again took the lead among dietitians in 1939 with the continuance of a series of broadcasts over station WHAM under the auspices of the Medical Society of the County of Monroe. As in the previous year, each dietitian's address was preceded by the short introductory comments of a leading physician of the medical society sponsoring the broadcasts.

Dr. Estelle E. Hawley outlined the essentially practical aspects of the vitamins; Eleanor N. Pfluke, modifications of the normal diet in certain disease conditions; Ella B. Guernsey, weight reduction and weight gain; and Effie Mae Winger, food fads.

An added feature this year was a discussion by Constance Hart, dietitian, Rochester Board of Education, of the noon lunch for the school child. In introducing Miss Hart, Dr. Lyman C. Boynton stated that the problem of an adequate noon lunch for the school child had been met in Rochester through providing cafeterias in 23 different schools in which 40,000 lunches are served in one week. "The lunchrooms were planned and operated with just one thought in mind—to provide proper nourishment for the school child at noon." Because of its interest to the dietitian as well as the lay public, the following excerpts from Miss Hart's discussion are presented:

> The Rochester school cafeteria service is not only a business organization, it is also an educational agency. It assists in teaching children better health habits by developing, on the part of the student, discrimination in the selection of food. In general, this objective is attained indirectly by means that are not too obvious.
>
> Menus are built around fruit, vegetables, milk and eggs, since many children do not receive enough of these protective foods at home. Various methods are used to increase the consumption of these foods. Milk is served in as many forms as possible. Vegetables are cooked in small quantities at intervals during the noon hour, thus retaining their vitamin content as well as their attractive color. Eye-compelling combination sandwich and salad plates are displayed. The matter of eye appeal and of pricing is possibly best illustrated in the sale of plate lunches, salads, and the simpler type of desserts. Because they appeal to the eye and to the pocketbook, the sales of these foods are increasing yearly.
>
> The menus must be extensive enough to appeal to the hungry boy or to the girl who chooses a light lunch at noon, and varied enough to attract those who of necessity patronize the lunchroom every day in the week.
>
> A constant effort is made to encourage the children to select the dark breads. In the school lunchrooms it has been found that children will eat sandwiches made with one slice of whole grain and one slice of white bread. Another method that has been used is to put the more popular fillings between two slices of whole grain bread. Children like sandwich fillings that are varied from day to day. Especially popular are cottage or cream cheese, tuna fish or salmon, cold sliced meats, hard cooked eggs, figs, dates,

and raisins chopped and moistened with orange juice, and finely chopped raw vegetables (mixed with cooked dressing) spread thickly between bread that has been spread to the edges with well-creamed butter so that the children will eat the crust. Strips of chilled carrots, green peppers and celery, wrapped in wax paper, not only help to furnish added minerals and vitamins but also give a contrast in texture and make the home packed lunch more interesting. Tray and plate lunches are available in both high schools and elementary schools. Plates and trays are planned with foods that are either new or need popularizing. They are priced so that there is a definite saving. A plate consisting of mashed potato and a vegetable is sold for seven cents. If the items were purchased separately they would cost ten cents.

In some of the lunchrooms the children were buying a five-cent Hamburg sandwich and standing to eat it during the noon period. To meet this indefensible situation, a plate lunch was substituted which consisted of a slightly smaller Hamburg sandwich, a small scoop of mashed potatoes, and a vegetable, all for five cents, the price formerly paid for the sandwich alone. Thus the children are getting a better type of luncheon and indirectly receiving a lesson in good eating habits. Even though the elementary school problem is similar to that in the high schools, there are a few factors peculiar to it. In general, the younger children have less money to spend, which means that a few simple, wholesome foods have to be made available to supplement the two home meals.

In the Rochester elementary schools, emphasis is placed on providing a nourishing lunch for as little as ten cents. These lunches consist of a hot dish, which may be soup, an egg dish, a vegetable or a meat extender; a cup of milk; a whole grain bread sandwich; and a custard or fruit for dessert. Liver is included on these plate lunches once a week either as a sandwich filling or as a part of the meat extender.

Good management and carefully considered menus are of little significance unless the purchasing set-up for the public school lunchrooms is efficient. Food supplies are obtained at the most advantageous prices and the quality is protected by carefully prepared specifications and accurate checking at the time of delivery. All food is bought on a competitive price quotation. The procedure is as follows: all prices are obtained by the central office, with the exception of fresh vegetables and fruit, and are sent out to the managers in order that they may place their orders directly with the firms.

The total purchases for each school lunchroom in Rochester are analyzed in the central office to show percentages spent for various items such as fruit, vegetables, milk, eggs, cheese and butter. This analysis is sent to each manager once a month with a notation concerning foods to be emphasized in planning menus.

The success of this whole program of teaching proper health habits to the children in the Rochester public school lunchrooms is measured by the increase of 160 per cent in the consumption of protective foods in the lunchrooms during the last two years.

CURRENT COMMENT

Monthly Cost Report for Dietary Departments of Small Hospitals

In spite of increasing interest in uniform cost reporting, there is little material on monthly cost reports for dietary departments of small hospitals. Some form of monthly report is almost universally required, but the vast majority of small hospitals in the state of Georgia include only the more obvious and direct expenses—raw food cost, salaries, and some groups of supplies—if, indeed, they go beyond the bare figure for raw food alone. But as the New York Conference on Hospital Accounting agreed: "Mere direct expenses are not sufficient. The cost of any unit must include not only its direct expenditures but its proportion of the outlay of other departments which enables the unit in question to function." The following report sheet was planned in accordance with the general principles laid down in Wm. A. Dawson's manual, *Procedure for Hospital Costs*, published by the United Hospital Fund of New York. The expenses are divided into direct expenses, which apply only to the dietary department, and indirect expenses, which are the dietary department's share of the general expenses of the institution.

The first direct expense is food cost. The gross food cost is arrived at by taking the total food bills for the month, adding the food inventory taken on the first of that month, and deducting the food inventory taken on the first of the succeeding month. Thus the gross food cost for May might be figured as follows:

Total Food Bills for May	$1,000.00
May 1 Food Inventory	300.00
	$1,300.00
June 1 Food Inventory	100.00
Gross Food Cost for May	$1,200.00

The raw food cost per meal is found by dividing the total number of meals served into the gross food cost. We write the different costs-per-meal in red so that they stand out distinctly from the costs for the month. From the gross food cost, income by food sold and any allowable discounts are deducted. Food sold would include meals for patients' guests and special nurses at the rates charged on the patient's bill. Discounts may be allowed on food taken in on bills when such food is higher priced than it would be on the open market; like other details, this practice must be adjusted to the needs of the institution. These deductions might read:

200 Special Nurse Meals @ $0.50	$100.00
25 Guest Trays @ $1.00	25.00
Allowable Discounts	10.00
Total Deductions	$135.00

Subtracting the total deductions from the gross food cost gives the net food cost. In order to find the raw food cost per hospital meal, subtract the number of guest trays, special nurse meals and any other extra-hospital meals that must be considered in your institution, from the total number of meals served, and divide the resulting figure into the net food cost. The raw food cost per hospital meal is more readily comparable with that of other institutions than the food cost per meal deduced from the gross food cost, because it has eliminated

several extraneous factors that vary considerably between hospitals.

The second direct expense is salaries, wages, and maintenance. A dietitian is usually paid by the month, and employees' wages must be calculated on a monthly basis by multiplying the weekly payroll by $4\frac{3}{7}$ for a 30-day month, or $4\frac{4}{7}$ for a 31-day month. Social security and any other allowances paid by the hospital in addition to the regular wage must also be figured. Under the heading, "Miscellaneous Salaries", is included amounts paid for extra help not on the regular payroll. Most hospitals give partial maintenance to their employees, and this must be considered along with the cash they receive as part of their wages. The value of the meals received by both staff and employees of the dietary department is figured by the raw food cost per hospital meal. If lodging is provided it, too, must be charged. Laundering of uniforms is more conveniently charged with the departmental laundry under "Supplies and Miscellaneous".

"Supplies and Miscellaneous" is the last heading under direct expenses. Glassware, china and silver should be charged in full on the month of purchase, for it is impractical to try to distribute such expenses throughout the period of use. Cleaning and miscellaneous supplies should include all paper supplies and should be charged from requisition slips at actual cost. Laundering should be charged by the piece if this is practical under the hospital set-up. If the laundry bill cannot be divided among departments according to actual amounts put in monthly, it may be necessary to make four one-week test periods at four separate seasons of the year, during which the material to be laundered is weighed or counted by departments in order to set up a fair division of such expense. Fuel used in cooking must be measured separately from power, heat, or lights. If electricity is used, it should be measured on a separate meter. Many small hospitals, however, have fuel on the same meter with power or lights in which case the power company is usually willing to install a temporary meter on the stove so the dietitian can determine the per cent of the hospital's kilowatt hours used for fuel over a period of at least eight or ten months. The charge should be figured on a per cent basis as a share of the total bill, rather than directly per kilowatt hour, because of the sliding scale of rates. Ice may be delivered separately to the dietary and nursing departments, in which case it may be charged directly on the cost sheets. But if the departments share ice, consumption must be tested at frequent intervals to determine fair allocation of the cost.

The indirect expenses of the institution are shared by the departments on the basis of payroll or on the basis of the area occupied by that department. The cost of administration, which includes salaries, supplies, telephone and all other administrative expenses, is allocated on the basis of payroll. The dietary payroll, including salaries and wages, is divided by the total hospital payroll to arrive at the per cent charged to the dietary department. This per cent of administrative expense is charged on the dietary cost sheet. It might be calculated as follows:

Total Hospital Payroll	$3,000.00
Dietary Payroll	$300.00
Dietary Payroll Per cent	10%
Administrative Expense	$500.00
Administration Charged to Dietary Department	$50.00

on the basis of area. This base is more difficult to determine than the payroll base because it demands accurate measurement of the entire hospital building, but once it has been calculated it need never be done again. The architect's plans showing these measurements may be available, or it may be necessary to have the entire building measured. Entrances, stairways, halls, waiting

Monthly Dietary Cost Report

A. DIRECT EXPENSES:			
1. Food Cost:			
a. Gross Food Cost		$1,200.00	
(10,000 Meals @ 12.0¢)			
b. Deductions:			
1. 200 Special Nurse Meals @ $0.50	$100.00		
2. 25 Guest Trays @ $1.00	25.00		
3. Allowable Discounts	10.00	135.00	
Net Food Cost			$1,065.00
(9,775 Hospital Meals @ 10.9¢)			
2. Salaries, Wages, and Maintenance:			
a. Dietitian		$100.00	
b. Employees (4⅜ × $49.00)		217.00	
c. Social Security (1% of Payroll)		3.17	
d. Miscellaneous Salaries		10.00	
e. 400 Dietary Meals @ 10.9¢		43.60	373.77
3. Supplies and Miscellaneous:			
a. Glassware, China and Silver		$10.00	
b. Cleaning and Miscellaneous Supplies		25.00	
c. Laundry		30.00	
d. Fuel		20.00	
e. Ice (55% of bill)		7.00	92.00
TOTAL DIRECT EXPENSES			$1,530.77
(Direct Cost per Hospital Meal 15.7¢)			
B. INDIRECT EXPENSES:			
1. Administration (15% of $500.00)		$75.00	
2. Housekeeping and Plant Operation (10% of $700.00)		70.00	
3. Depreciation (10% of $650.00)		65.00	
4. Insurance and Taxes (10% of $300.00)		30.00	
5. Repairs		15.00	
TOTAL INDIRECT EXPENSES			$255.00
(Indirect Cost per Hospital Meal 2.6¢)			
C. TOTAL COST OF DIETARY DEPARTMENT FOR MAY			$1,785.77
1. *Cost per Hospital Meal, 18.3¢*			
2. Cost per Patient Day (1,500 Patient Days)			$1.19

The figure for administrative expense, like all indirect expenses, must be determined by the hospital accountant or bookkeeper.

Other indirect expenses are allocated

rooms, and any other area used by the whole institution are not to be counted. But each department is to be measured, including closets, pantries, and every other square foot in the department; then the total number of square feet in all the departments must be divided into the number of square feet in the dietary department to find the per cent area occupied by the dietary department. This per cent is used in determining charges for housekeeping and plant operation, depreciation, insurance and taxes, and sometimes repairs. Allowances for depreciation, insurance and taxes are usually set by the auditors, so they are fixed figures. Repairs should be charged on an analysis base, and in small hospitals without a maintenance department where all repair work is done by an outside concern charges should be made directly from the bills; but in many hospitals with a maintenance department it is more practical to apportion this expense on the basis of area.

Under total dietary expenses, two unit figures are important for purposes of comparison: the total cost per hospital meal, and the dietary cost per patient day.

Over a period of six months, our dietary department has spent approximately 85 per cent of its budget on direct expenses and 15 per cent on indirect expenses. The direct expenses have been subdivided as follows: 56 per cent net food cost; 22½ per cent salaries, wages and maintenance; and 6½ per cent supplies.—LOIS STURMER, *Dietitian, Strickland Memorial Hospital, Griffin, Georgia.*

STANDARDIZED BUYING PROCEDURES[1]

Standardization in relation to buying has far-reaching possibilities. It demands definite specifications that can be determined only after careful research and trial. If one has such specifications, vendors can quote prices intelligently and when the merchandise is received it can be accurately checked to see that it is up to standard. Specific instructions can then be issued for the proper use of the article by the employees.

What are some of the items for which we should have standardized buying procedures? Among these we may unquestionably include chinaware and silverware with regard to design, pattern and durability. You should know whether your tumblers and glassware are showing as much or more breakage than that of other institutions under comparable circumstances. Do you have definite weave counts and weights for your table linen and sufficient quantities on hand to allow "resting" intervals between use? This is important, for the longevity of such fabrics may be thus increased at least twenty per cent.

Details on specification and standardization perhaps are most important when purchasing kitchen equipment such as mixers, dish-washing equipment and food trucks, for one must remember in purchasing equipment of this kind that future maintenance will be required. If you have a hodge-podge of equipment,

[1] Abstract of an address by Mr. James F. Best, purchasing agent, New York Hospital, at the annual meeting of the New Jersey Dietetic Association, New Brunswick, November 17, 1938.

then your chief engineer must have a hodge-podge of repair parts to maintain it properly and his mechanic will not be nearly as familiar with several makes as with that of one company's manufacture. It is advisable when purchasing equipment of this type to call in the chief engineer for consultation on the mechanical advantages or disadvantages of the machines being considered for purchase.

With regard to standardized specifications on food, what requirements shall we make? If we are buying canned goods, the color, the gross weight and the drained weight are factors. The section of the country where the product is grown will probably count and certainly the texture and firmness will determine for the vendor the quality on which he should quote. Having the quality fixed, the vendors' prices are received and samples requested for a test specification that cannot be put on paper, and that is *taste*. Another feature of this fixed quality is that vendors' prices will be more nearly uniform and you are able to judge your competition better and fairer.

The same care should be exercised in setting up specifications on other items such as meats, eggs and butter, as determined by government grades, and milk according to butterfat content. With items such as shortening and cooking fats it will be necessary to make your own tests in order to determine the longevity of its usefulness, its taste and its economical advantages.

Do not waste time with salesmen who go out quite unprepared to be of the slightest benefit to their prospective customers, or those making exaggerated statements as to the efficiency of their line and its economies. Obviously we cannot buy from all who approach us and it is just as obvious that there must be three or four of the hundreds of products in the market that would rate highly from competitive, efficient and economic angles, if we can determine which these are.

A dishwashing compound, for example, has certain definite functions to perform: to soften the water, emulsify the grease on dishes and hold it in suspension to be carried off in the overflow, and to allow the china and glassware to dry quickly without leaving a film, for we must always remember the labor expense if dishes must be toweled, as well as the expense of towels and laundering.

Floor waxes should have non-slip qualities, protecting without deteriorating the surface, and lasting properties, for labor in applying amounts to more than the cost of the wax. One way to buy such products wisely is to send a selection to a consultant for testing and recommendations.

To summarize the mechanics of buying, one should select vendors according to the quality of the goods required and the price range demanded. If you want high quality merchandise, have only high quality merchants on your lists. If your requirements are for medium quality do not bolster your competitive list with high-priced and low-priced dealers, for their quantity buying is not done in your quality and you will not be able to judge prices fairly.

Select your vendors, therefore, with care, according to your requirements, and once having proved their honesty and fairness, show your appreciation. They will then be eager to develop short cuts which should assist you in obtaining

quality merchandise at minimum prices, and will inform you when to buy and when not to buy. Remember always that the competent salesman is as expert in his line as you are in yours.

Treat courteously all salesmen who come to see you on their appointed day. The man whom you turn away with a curt dismissal today may be the man who could do you a favor next week. It is true that you cannot buy from everyone, therefore if you cannot use a man's services, frankly tell him so and your reasons so that he may concentrate his efforts on other prospects where his opportunities of selling are more favorable. Beware of the high pressure salesman, the man who tries to rush you off your feet. Generally he has a "hot potato" which he will most certainly put in your hands if you are gullible enough to receive it.

Food Service at Gloucester House

Gloucester House, the private pavilion at the Royal Prince Alfred Hospital, Sydney, New South Wales, Australia, is designed to cater to private and intermediate patients, consequently a high standard of organization must be maintained. At the present time more than 2500 meals per week are prepared and served.

The responsibilities of the dietitian include the supervision of the quality and quantity of foods purchased, preparation and service of food to the patients, and menu planning, waste checking and visiting patients to ascertain their likes and dislikes. Food costs are approximated in the department and calculated accurately by the hospital accountant's office staff, in order to estimate per capita costs. The food department then checks these costs for correct apportioning of money among the food groups essential in an adequate dietary.

Menus are planned in a series of 100 or more menu cards which are altered weekly according to the available fruits and vegetables. Two weeks ahead a 7-day series is assembled carefully to give variety and to include seasonal foodstuffs. The menu card for the following day is given to the patient with the breakfast tray so that he may select his choice for the next day. Comments are occasionally made upon choosing so far ahead, but when a patient is unable to eat what he ordered the day before, a reasonable alteration can always be made.

The dietitian visits each patient daily to collect the menu card, assist in selection, discuss the type of food suitable for the individual, and to acquire a knowledge of the patient's likes and dislikes. Any incorrect eating habits are explained to the patients where possible, but the department's nightmares are overanxious mothers and wives, and patients with their own definite eating habits, solidified through years of home practice. We often hear: "I never mix proteins and starches", or "He has never had green vegetables, he wants ice cream", and "Salads in winter—oh no!", which calls for all the dietitian's patience and powers of persuasion.

The dietary stenographer summarizes the orders which she lists for the cooks and special diet cook. From these lists, daily milk, cream, butter, bacon and egg orders are made out by the dietitian, also daily fruit and vegetable orders included in the main hospital order for

the market buyer. Grocery orders are compiled three times weekly, meat, fish and poultry being ordered daily as required.

The Gloucester House kitchen staff includes a meat cook and a "sweets" and salad cook, each with her own maid, while the special diet cook and vegetable preparer are shared with the main hospital. All cooking save that of eggs is done in the hospital kitchen, the eggs being cooked in Gloucester House central "servery" over gas burners.

The food is placed in hot or cold containers on electrically heated or insulated trolleys to be wheeled through lifts and passages to Gloucester House. The cold section caters for salads, cold sweets and fruits. Each food is apportioned into servings for the floors (five of them) so that on arrival in the hot conveyors the containers may be sent immediately to the floors where they are put on heated steam tables in each servery. The food is checked and tasted for quality by the dietitian in the main kitchen, and again checked for quantity in the central servery. On each floor the maids set up trays complete with the patient's menu card. The nursing sister on the floor serves the meals, the nurses carrying the trays to the patients.

Over representative periods, all garbage from foodstuffs is weighed and the percentage waste calculated. In the event of large amounts of any one food being left uneaten, a reason is sought. If the investigation proves poor cooking, everything possible is done to remedy this if the dish is repeated; if the dish suffers from sheer unpopularity, it is discontinued on the menu. No money within reason or effort is spared to provide quality foods for Gloucester House. Each item checked into the dietary department is inspected by a dietitian and chef before acceptance, and any food not up to standard is immediately rejected.—AILEEN E. MORRISON, *Dietitian.*

CORRECTION—OCTOBER JOURNAL

Under the title "Planning the Day's Diet for Vitamin Content", Dr. Hazel E. Munsell, the author, calls attention to the following errors: on page 644, paragraph 4, the last two lines should read "Bourquin-Sherman units (approximately 2000 micrograms) per day". In table 1, column 3—the value for ascorbic acid should be "40 to 60 mg." rather than "40 to 50 mg." In table 2 the values stated for riboflavin are in terms of Bourquin-Sherman units, not International units. There is no International unit for riboflavin (vitamin G).

BOOK REVIEWS

Nutrition and Diet in Health and Disease. By James S. McLester, M.D. Third edition. Philadelphia: W. B. Saunders Company, 1939, pp. 838. Price $8.00.

This current edition of Dr. McLester's authoritative work has been eagerly awaited by dietitians, for the science of nutrition and its therapeutic application in disease have made rapid strides since the second edition appeared in 1931. To Dr. McLester, who is an honorary member of the American Dietetic Association, great credit is due for having pioneered in the field of the clinical application of the scientific findings of nutrition. Since the first edition of his book in 1927 we have seen a decided change in the physician's concept of nutrition—no longer does he tell the patient merely what he must not eat, but what he *must* eat. Moreover, Dr. McLester has recognized the need to treat the patient as a whole, with due regard for his basic nutritional needs.

In keeping with the nutritional advances of the past 8 years, the current edition has been entirely rewritten, retaining here and there only such paragraphs as, for example, the classic Sippy method for treating peptic ulcer. All this is in keeping with recent knowledge and changes in point of view. Much space has been given to a consideration of the nature and physiologic influences of the several nutritive substances, all of which is conducive to intelligent dietary management. The chapter on the feeding of infants has been written by Dr. P. C. Jeans, professor of pediatrics at the University of Iowa, and that on the feeding of surgical patients by Dr. Dean Lewis, professor of surgery at Johns Hopkins University. Whole chapters are devoted to the utilization of food (two), fuel requirement, the protein problem, the vitamins, minerals and water, and nutritional factors of less importance. These and the section on food products and diet in health, complete Part I.

Part II, nutrition in disease, includes 54 pages devoted to deficiency diseases, a digest of current and accepted dietary methods in the treatment of diabetes, with sample menus, diet formulas and other tabular material, and chapters on spontaneous hypoglycemia, gout, obesity and leanness, food poisoning and allergy, and diseases of the kidney and urinary tract, the digestive organs, febrile diseases, the heart and arteries, the blood, the joints, the nervous system, endocrine disorders, the skin, and feeding the surgical patient. Part III covers special methods of feeding, the Chatfield and Adams' food composition tables, Locke's tables of alcoholic beverages, and the vitamin tables of Daniel and Munsell, Boas-Fixsen, and Sherman's tables on ash constituents.

Fundamentals of Chemistry and Applications. By Charlotte A. Francis and Edna C. Morse. New York: The Macmillan Company, 1939, pp. 527. Price $3.00.

According to the authors' preface this book is intended for use in connection with the applied sciences and arts such as physiology, cookery and nutrition, bacteriology, materia medica, and nursing practice. It is not intended as a substitute for an inorganic text, an organic text, or a biochemistry text, but as a brief course in chemistry for the purpose of making the applied sciences and arts more meaningful. In other words, the content has been determined primarily by a study of what chemistry can contribute most fundamentally to the professional needs of the student. Although designed as a text, the book should prove a useful reference for students of home economics and applied science as well as nursing.

The Discriminating Hostess. A Book of Menus and Tested Recipes. By Ella Liner Lambert. Milwaukee: 1939, pp. 367. Sent postpaid upon receipt of check or money order for $2.50 by the author, 626 East Wisconsin Avenue, Milwaukee, Wisconsin.

Mrs. Lambert, who is director of the Home Economics Department, Milwaukee Gas Light Company, has drawn on her 16 years of experimental work and as teacher of students and homemakers in preparing this book. She has included 99 of her favorite menus and 840 recipes, many of which are original and all of which are tested. She has arranged her recipes in accordance with the accepted standards of scientific cookery. Definite temperatures, time, and volume or serving yield, are stated.

A helpful feature for the harried housewife or menu planner is the inclusion of boxed-in menus

at the top of some of the pages on which recipes for dishes included in the menu appear. Recipes and menus and details of service for special occasions—holidays, formal service, afternoon teas, cocktail parties, buffet suppers and evening refreshments—are other practical assets of the book. All these and the luncheon menus featuring vegetable or salad plates, the oven dinners, and dinners featuring fish make this book a distinct contribution to the list of available culinary references.

Mary Hunt's Salad Bowl. By Mary Hunt Altfillisch. New York: M. Barrows & Company, 1939, pp. 102. Price $1.00.

The author, who operates one of the better Minneapolis restaurants, writes in praise of the salad bowl, one of today's vogues which she says originated in Arabia. It would be well to emphasize one line in her book, *i.e.* "the simplest salad is sometimes the most appealing." Regrettably the simple green salad, crisp, cool, and delicately enhanced in flavor by appropriate dressing, is too seldom encountered. An interesting feature of the book is the description of the various types of wooden bowls to be used for salads.

In this reviewer's opinion, especially commendable are the salad dressings, the seafood salads, the cold seafood platters, the meat salads, and the suggestions for salad plates. Recipes for sandwiches and canapés, relishes and miscellaneous dishes, and menus for luncheons, dinners, suppers and special occasions, combine to make this book a good source of ideas. Except for a rather general tendency toward listing recipe ingredients in reverse, or slightly scrambled order, the book should be a good addition at a small price to the culinary reference shelf.

CURRENT LITERATURE

American Journal of Digestive Diseases

Vol. 6, September 1939

*The etiology, diagnosis and medical management of pancreatic disease. E. H. Gaither.—p. 429.
*The activity of the lower part of the ileum of the dog in relation to the ingestion of food. D. M. Douglas and F. C. Mann.—p. 434.
*Over two thousand estimations of the *p*H of representative foods. M. A. Bridges and M. R. Mattice.—p. 440.
*The nutritional availability of iron in molasses. R. S. Harris, L. M. Mosher and J. W. M. Bunker.—p. 459.

PANCREATIC DISEASE. The type of diet in pancreatic disease is dependent in great degree upon the urgency or mildness of the symptoms; if marked complaint is made of gas, discomfort, and the usual galaxy of various uncomfortable sensations, a soft puréed diet, properly balanced and with particular attention to caloric sufficiency, is prescribed. Many cases are associated with hepato-biliary disease, and the diet must be based upon this knowledge. Fats in the form of "natural fats" such as cream, butter, eggs, olive oil, are allowed in moderation; care is always exercised to interdict the synthetic and cooked fats and greasy foods. The type and variety of food is gradually increased until a general well-balanced diet is used without untoward dyspeptic symptoms.

ILEAC ACTIVITY IN RELATION TO FOOD. The activity of exteriorized loops of the lower part of the ileum was studied in the dog in relation to the ingestion of food. A regular cycle of activity was noted in the normal animal: namely, a rapid motor response to feeding, followed by prolonged activity which gradually diminished until, after 48 hours of fasting, the activity was extremely feeble. The degree and type of activity in the lower part of the ileum of the dog is intimately connected with the ingestion of food.

P_H OF REPRESENTATIVE FOODS. The *p*H of over 400 representative foods is presented in tabulated form. The most important factor in food is the property of stimulating gastric juice, whether this be attributable to hydrogen-ion, to other constituents in food, or to products of digestion. Actually few substances can compete with the acidity of hydrochloric acid in the stomach. The immediate physical effect of introducing food into the stomach is to dilute the gastric juice and so diminish the acidity. Since the normal response to the presence of food is secretion of acid and pepsin for digestion, the ultimate result may be increased acidity regardless of the original reaction of the food.

AVAILABILITY OF IRON IN MOLASSES. Molasses is a rich and inexpensive source of available iron. By chemical procedures the availability of iron in first, second and third grade molasses was found to be 97%, 80% and 54% respectively. The biological method gave figures slightly lower, 90%, 80% and 50%.

American Journal of Diseases of Children

Vol. 58, September 1939

*Obesity in childhood. I. Physical growth and development of obese children. H. Bruch.—p. 457.
*Influence of fluid and evaporated milk on mineral metabolism of growing children. H. J. Souders, H. A. Hunscher, F. C. Hummel and I. G. Macy.—p. 529.

OBESITY IN CHILDHOOD. Growth and maturation of 102 obese children, 2 to 13 years of age, are compared to normal standards. Growth in stature is in excess of the average normal but in harmony with the height development of children who mature early. Skeletal maturation is normal or advanced. The findings of intensive growth and early maturation agree with observations of the growth-promoting effect of abundant nutrition.

MILK AND METABOLISM. Three average healthy children 4½ to 6 years of age under favorable physical and mental environmental conditions were given 400 gm. of plain fluid milk daily for 25 to 40 consecutive days. During the 20 to 25 days immediately following, 400 gm. of dilute (1:1) evaporated milk was substituted. For the next 25 days 90 U.S.P. units of vitamin D in irradiated evaporated milk were added. An added impetus to formation of soft tissue resulted from the substitution of evaporated for fluid milk, as shown by increases in retention of nitrogen, sulfur and potassium. When irradiated evaporated milk was included in the diet, the increased calcium-phosphorus ratios of the retentions and the increase in rate

of gain in recumbent length indicated a more rapid and stable rate of bone formation.

American Journal of the Medical Sciences

Vol. 198, September 1939

*The effect of alteration in the metabolic rate on the action of insulin. G. W. Hayward and G. Duncan.—p. 396.

*Cevitamic acid deficiency. Frequency in a group of 100 unselected patients. J. D. Croft and L. D. Snorf.—p. 403.

ACTION OF INSULIN. Alterations in metabolism in normal and diabetic subjects, produced by artificial fever and sodium dinitrophenol, shorten the period of insulin activity, with little change in the actual degree of depression of the blood sugar. Results give proof of the advisability of giving frequent doses of insulin to diabetic patients with infections and fever.

CEVITAMIC ACID DEFICIENCY. Of 100 patients hospitalized for medical investigation or treatment, 38 had plasma cevitamic acid concentrations below 0.40 mg. %. Of the deficient group of 38, only 8% were on a diet adequate in vitamin C, while in the non-deficient group 71% gave diet histories indicative of adequate vitamin C intake. A control group of 50 nurses on an ordinary diet gave plasma cevitamic acid values of from 0.60 to 1.12 mg. %. Dental caries and gingival sepsis were common in the deficient group, while the reverse was true in the normal group. Moderate to severe grades of cevitamic acid deficiency are not uncommon among people economically able to obtain a sufficiency of foods which presumably would prevent it.

American Journal of Public Health

Vol. 29, September 1939

*Occurrence, pathological aspects, and treatment of fluoride waters. M. S. Nichols.—p. 991.

FLUORIDE WATERS. Minute amounts of fluorine as fluorides in drinking water produce an imperfect enamel structure in the teeth during the formative period. This has created a serious problem in water supply throughout the world in general. The action of fluorine may not be confined to the teeth, but may have pathological effects upon other parts of the body structure. No proof has been brought forward to show that fluorine is altogether a useless or harmful element rather than an element active and needed in minute quantities such as copper. The origin of all fluorine-bearing minerals is the igneous rocks underlying all sedimentary formations.

Annals of Internal Medicine

Vol. 13, September 1939

*The significance of post-prandial glycosuria in the treatment of diabetes mellitus with protamine zinc insulin. I. M. Rabinowitch.—p. 385.

*The vitamin C requirement in rheumatoid arthritis. M. G. Hall, R. C. Darling and F. H. L. Taylor.—p. 415.

POST-PRANDIAL GLYCOSURIA. The post-prandial glycosuria in diabetes treated with protamine zinc insulin, when associated with a perfectly normal blood sugar in the fasting state, is not harmful. This conclusion was based entirely upon the use of protamine zinc insulin with the high carbohydrate-low caloric diet. It may not necessarily apply to other diets.

VITAMIN C IN ARTHRITIS. Patients with rheumatoid arthritis actually have a much greater demand for vitamin C than the normal individual. When given 200 mg. of vitamin C per day for 8 months, they showed no improvement that could be attributed to the effect of the vitamin.

Canadian Medical Association Journal

Vol. 41, September 1939

*Results of the self-selection of diets by young children. C. M. Davis.—p. 257.

SELF-SELECTION OF DIETS. Infants 6 to 11 months of age who had never had supplements were allowed to choose their own diet from a wide range of animal and vegetable foods. The food list was confined to natural, unprocessed and unpurified foods without made dishes of any kind. The average daily calories consumed were found in every instance to be within normal limits. All diets showed a decline in protein per kg. of body weight in accordance with the change in the relation of body-building requirements to energy requirements that comes with growth and increased activity. The children's bones showed excellent calcification. The babies looked and were well nourished, and eating problems and anorexia were eliminated.

Hygeia

Vol. 17, September 1939

*How much should he eat? E. F. Patton.—p. 783.

HOW MUCH TO EAT? There is probably no case on record where a child actually starved himself enough to do any damage unless he was afflicted with some disease. More trouble comes from overfeeding, or attempted overfeeding, than ever resulted through voluntary food refusal. Children vary widely in their fundamental food requirements. Age, sex, body type, activity, glandular function and physiologic activity enter into the picture. Height-weight-age charts must be considered as averages, not as normals. There is no normal for every child, only for each child. Balance of diet is essential. Whatever small quantity is taken, it should be distributed suitably among milk, cereals, vegetables, fruits, meats, eggs and fish liver oil.

Journal of Biological Chemistry

Vol. 130, September 1939

*The synthesis of cozymase and of factor V from nicotinic acid by the human erythrocyte in vitro and in vivo. H. I. Kohn and J. R. Klein.—p. 1.
*The effect of orange juice on calcium assimilation. C. S. Lanford.—p. 87.
*Total sulfur, cystine, and methionine content of blood globins of five mammalian species. E. F. Beach, S. S. Bernstein, F. C. Hummel, H. H. Williams and I. G. Macy.—p. 115.
*The isolation of vitamin K_1. S. B. Binkley, D. W. MacCorquodale, S. A. Thayer and E. A. Doisy.—p. 219.
*Mineral metabolism, growth, and symptomatology of rats on a diet extremely deficient in phosphorus. H. G. Day and E. V. McCollum.—p. 269.
*A relationship between the nature of the vitamin B complex supplement and the ability of homocystine to replace methionine in the diet. V. DuVigneaud, H. M. Dyer and M. W. Kies.—p. 325.

FACTOR V. The synthesis of factor V from nicotinic acid by human erythrocytes has been demonstrated *in vitro* as well as *in vivo*. Accompanying this synthesis, there is an increase in the rate of oxidation of lactate by the corpuscles. The synthesis is limited ordinarily by the presence or absence of nicotinic acid, defibrinated blood containing all else that is necessary.

ORANGE JUICE AND CALCIUM ASSIMILATION. Young, growing rats were fed moderate amounts of orange juice in addition to a basal wheat and milk mixture. The proportion of the calcium of the diet which was stored in the body under these conditions was about 8% greater than the proportion stored by control animals on the basal diet alone. Improved assimilation was noted in every instance, and was of unquestionable significance by the usual statistical criteria.

SULFUR OF BLOOD GLOBINS. The cystine, methionine, and total sulfur contents of globins from the bloods of five mammalian species were determined and found to vary. Results suggest that the specificity of hemoglobins depends upon differences in their amino acid composition.

ISOLATION OF VITAMIN K_1. By the use of decalso, permutit, and darco as adsorbents, vitamin K_1 has been isolated in a practically pure state. Crystallization, or distillation and crystallization, has given the pure vitamin.

EFFECT OF P-DEFICIENT DIET. The preparation of a diet composed of purified materials has been described which contains only 0.017% phosphorus, but adequate amounts of other nutrients. Young rats restricted to the diet grow slowly for 5 to 6 weeks, and then decline and die 2 to 3 weeks later. Extreme rarefaction of the skeleton quickly occurs, accompanied by progressive disability in walking, standing, and breathing. Nitrogen retention was positive for 5 weeks and then became negative simultaneously with the onset of loss of weight. The tremendous loss of calcium was principally through the urine, but most of the excreted phosphorus was in the feces. Data indicate that a significant amount of phosphorus mobilized from the bones was re-deposited in the soft tissues in spite of the continuous negative phosphorus balance.

UTILIZATION OF HOMOCYSTINE. Homocystine or homocysteine is incapable of supporting growth of animals on an amino acid diet devoid of methionine and cystine, supplemented daily with 0.02 mg. of riboflavin, 0.02 mg. of nicotinic acid, 0.02 mg. of crystalline thiamin chloride and 25 mg. of ryzamin-B as a source of the other vitamin B factors. With the same basal diet but with the vitamin B factors supplied by tikitiki and milk vitamin concentrate, homo-

cystine was found to support growth. Some factor or factors are present in tikitiki and milk vitamin concentrate which are not present in sufficient amounts or are lacking in the vitamin mixture of thiamin, riboflavin, nicotinic acid, and ryzamin-B which makes possible the utilization of homocystine by animals on a methionine-deficient diet.

Journal of Clinical Investigation

Vol. 18, September 1939

Studies in iron transportation and metabolism. IV. Observations on the absorption of iron from the gastrointestinal tract. C. V. Moore, W. R. Arrowsmith, J. Welch, and V. Minnich.—p. 553.

*The occurrence of abnormal dark adaptation and its relation to vitamin A metabolism in patients with cirrhosis of the liver. A. J. Patek, Jr. and C. Haig. —p. 609.

VITAMIN A AND CIRRHOSIS OF THE LIVER. Abnormal dark adaptation in patients with cirrhosis of the liver is due chiefly to altered intermediary metabolism of vitamin A rather than to a deficient intake.

Journal of Nutrition

Vol. 18, September 1939

*The calcium content of white bread. W. W. Prouty and W. H. Cathcart.—p. 217.

*Oxalic acid in foods and its behavior and fate in the diet. E. F. Kohman.—p. 233.

The distribution of the chick antidermatitis factor in meats and meat products. H. A. Waisman, O. Mickelsen and C. A. Elvehjem.—p. 247.

*On the approximation of the calculated to determined calcium content of human dietaries. A. B. Gutman and M. Low.—p. 257.

The rat growth factors of the filtrate fraction of liver extracts. G. H. Hitchings and Y. Subbarow.—p. 265.

*The effect of phosphorus on the biological estimation of vitamin D activity. B. O'Brien and K. Morgareidge. —p. 277.

CALCIUM CONTENT OF WHITE BREAD. Thirty-nine of the most popular commercial loaves of white bread from 33 bakeries and 27 states contained 3 times as much calcium as reported by previous investigators. Milk and yeast foods are being used in increased amounts more than formerly. Six slices of average commercial bread will supply approximately 30% of the daily adult calcium requirement, assuming that all the calcium is assimilable.

OXALIC ACID IN FOODS. If to a diet relatively low in calcium but permitting good though not maximum growth and bone formation, spinach is added to supply 60% of the calcium, a high percentage of deaths occurs among rats; reproduction is impossible; the bones are extremely low in calcium; tooth structure is disorganized; and dentine is poorly calcified. Spinach not only supplies no available calcium but renders unavailable considerable of that in the other foods. Turnip greens, mustard greens, kale and collards, greens with negligible oxalates, under similar conditions produce animals that deposit 4 times as much calcium per unit of body weight. The oxalic acid content of fruits and vegetables is tabulated.

CALCIUM IN HUMAN DIETS. In 22 of 28 observations, Sherman's revised tables for calcium gave better agreement between calculated and found values than did earlier figures. A disproportionate number of calculated estimates exceeded the determined values, the positive deviation being greater than 25% of the calculated value in 10 of 16 low calcium diets.

PHOSPHORUS AND VITAMIN D ACTIVITY. Under conditions commonly employed for the biological estimations of vitamin D, phosphorus added to the vitamin supplement greatly enhances its apparent potency.

Journal of Pediatrics

Vol. 15, July 1939

*The supplementary value of the banana in institution diets. I. Effect on growth in height and weight, ossification of carpals, and changes in Franzen indices. L. J. Roberts, R. Blair, G. Austin and G. Steininger. —p. 25.

*The supplementary value of the banana in institution diets. II. Capillary resistance and reduced ascorbic acid in the blood plasma. L. J. Roberts, M. H. Brookes, R. Blair, G. Austin and I. Noble.—p. 43.

EFFECT OF BANANA SUPPLEMENT ON GROWTH. The diet of 123 boys in an institution was supplemented with 2 to 3 bananas daily over a 9-month period. The bananas were well liked by the boys and were eaten with the same relish and dispatch at the end as at the beginning of the study. The experimental boys made a slightly greater mean gain in weight and height than the controls. The wrist bones of the experimental boys showed greater progress. The boys who had received the supplement made greater mean gains in measurements of

arm girth, subcutaneous tissue, and weight, and also in the scores for these items.

EFFECT OF BANANA SUPPLEMENT ON CAPILLARY RESISTANCE. The diet of boys ranging in age from 8 to 16 years was supplemented with 2 to 3 bananas daily over the entire school year. Although the usual diet of the institution measured up to the minimum dietary standards, it appeared susceptible to improvement. Boys receiving the supplement showed consistently better growth and development by every measure of physical status. The most significant differences were those for blood ascorbic acid. The experimental boys averaged 0.20 mg. per 100 cc. of plasma higher than the control boys; this difference is 6 times its probable error and therefore significant.

Journal of the American Dental Association

Vol. 26, September 1939

The modified dental caries index. C. F. Bodecker.—p. 1453.

Journal of the American Medical Association

Vol. 113, September 2, 1939

*Pellagra, beriberi and riboflavin deficiency in human beings. T. D. Spies, R. W. Vilter and W. F. Ashe.—p. 931.

Vol. 113, September 9, 1939

*The inheritance of epilepsy as revealed by the electroencephalograph. W. G. Lennox, E. L. Gibbs and F. A. Gibbs.—p. 1002.

Vol. 113, September 16, 1939

*Dental caries and domestic water supplies. Editorial.—p. 1132.

Vol. 113, September 30, 1939

*Crystalline insulin. A. Marble and I. Vartiainen.—p. 1303.

*Solutions of amorphous insulin and solutions of zinc insulin crystals. H. T. Risketts and R. M. Wilder.—p. 1310.

PELLAGRA, BERIBERI, AND RIBOFLAVIN DEFICIENCY. Specific therapy with synthetic chemical substances will bring about a remission of the symptoms and signs characteristic of these diseases, even when the patient is maintained on a diet of dextrose and distilled water. Improvement will be much more striking and permanent if these patients are maintained on a well balanced and liberal diet, at least one-half of which should consist of lean meat, milk and eggs. When it is impossible for the patient to obtain this type of diet, 75 gm. brewer's yeast, 100 gm. rice polishings or 150 gm. wheat germ daily is extremely valuable as a daily supplement to the diet. The importance of the diet is further emphasized by the observations that pellagrins treated with nicotinic acid and without a change in dietary regimen often acquire beriberi, riboflavin deficiency, or both, after the manifestations of pellagra have been relieved. These do not occur when the patients eat a balanced diet.

EPILEPSY. Electro-encephalographic tracings were made simultaneously in 138 parents, children or siblings of patients with epilepsy. Abnormal records were obtained in 54% of the relatives, against 6% in a control group who were unrelated to epileptic persons. Of 46 families in which records were made of both parents, 28% showed both parents with abnormal records while 94% showed one parent with an abnormal record. Evidence indicates that the dysrythmia of epilepsy is inheritable and may represent a predisposition to epilepsy or some allied disorder.

DENTAL CARIES AND WATER SUPPLIES. Fluorides have been looked upon as undesirable elements in the water supply because of their rôle in producing mottled enamel. There is a lessened prevalence of dental caries among persons who live in regions where endemic fluorosis exists. Investigation of white children of 12 to 14 years in four cities of western Illinois showed the dental caries rate in cities supplied with water almost free of fluorides to be 2 to 3 times greater then the rate observed in the other communities. There were 16 times more interproximal caries in the groups where the water was extremely low in fluorides. The composition of the water in other respects may be a factor. Dental caries might be partially controlled through the water supply.

CRYSTALLINE INSULIN. Detailed studies comparing the rapidity of action and duration of effect of unmodified insulin made from amorphous material and of solution of zinc insulin crystals were carried out on 8 normal persons and on 8 patients with severe grades of diabetes of long duration. Insulin made from amor-

phous material and insulin specially prepared as solution of zinc insulin crystals caused a prompt fall of blood sugar in both normal and diabetic subjects. The lowest point in the blood sugar curve was reached in 6 hours with amorphous and in 7 hours with the crystalline variety.

AMORPHOUS AND CRYSTALLINE INSULIN. Blood sugar time was observed in diabetic patients given single doses of insulin without food. Regular and crystalline insulin appeared to act very similarly. The average of all data with crystalline insulin shows a slight but significant prolongation of action, though no difference in speed of action, when compared with the average data on amorphous insulin.

Public Health Reports

Vol. 54, September 29, 1939

*Possible relation of calcium deficiency to the utilization of vitamin B_1. L. F. Badger and E. Masunaga.—p. 1775.

CALCIUM AND VITAMIN B_1. Calcium deficient rats were found to be much more susceptible to rat leprosy than normal rats and about as susceptible as vitamin B_1-deficient rats. Animals maintained on the calcium deficient diet receiving vitamin B_1 in the purified form by mouth were found to be no more suceptible than normal rats. Although vitamin B_1-deficient rats were much more suceptible than normal rats, the percentage of calcium in the tails was the same as in normal rats. Although calcium-deficient rats receiving vitamin B_1 in the purified form by mouth were no more susceptible than normal rats, the percentage of calcium in the tails was much less than in normal rats. The amount of vitamin B_1 in the circulating blood of calcium-deficient rats was found to be approximately the same as in the blood of vitamin B_1-deficient rats. Findings suggest that the increased susceptibility is due to vitamin B_1 deficiency and not to a calcium deficiency.

Science

Vol. 90, September 8, 1939

*Glycogen in sweet corn.—p. 238.

Vol. 90, September 15, 1939

*The chemical structure of vitamin K.—p. 10.

Vol. 90, September 22, 1939

*Ease of body heat loss and resistance to infection. J. W. Colvin and C. A. Mills.—p. 275.

*Improved chemical treatment for common colds. R. D. Potter.—p. 7.

GLYCOGEN IN SWEET CORN. A polysaccharide apparently identical with glycogen has been extracted from sweet corn. It is hydrolyzed at a rate much lower than that of the starches, higher than that of the animal glycogens, but nearly identical with that of yeast glycogen.

CHEMICAL STRUCTURE OF VITAMIN K. The chemical structure of vitamin K was determined by 2 research teams of outstanding chemists, working independently. Vitamin K, playing an essential rôle in making blood clot, will help produce more, better, and healthier babies, cleaner operations by surgeons with less risk, and help for those whose blood does not clot in normal fashion.

BODY HEAT LOSS AND RESISTANCE. White mice adapted to moist heat exhibit only one quarter as much resistance to infection as do litter mates adapted to a cool environment, while mice in a control room fall midway between. Difficulty in body heat loss and a lowered tissue combustion rate result in a sharply reduced ability to fight infectious invasion. Undernutrition from dietary inadequacy makes animals less resistant to infection. The difficulty in body heat loss may work in a similar fashion by making impossible the adequate utilization of even the most perfect diet.

TREATMENT OF COMMON COLD. An improved chemical advance in the fight against the common cold has been announced. Drugs frequently used in treating colds,—adrenalin, ephedrine and benzedrine, are reacted with vitamin C to produce stable compounds of enhanced physiological action. Both the drugs and the vitamin are, by themselves, unstable materials, losing their potency with relative quickness. In combination they form compounds that retain their potency for over 2 years.

INSTITUTION MANAGEMENT

The American Restaurant Magazine

Vol. 23, September 1939

*Here's how you can avoid legal liability. L. T. Parker.—p. 32.
*Is pie worth merchandising? M. B. Strause.—p. 40.
*Fall fruits and vegetables add menu variety. L. D. Freeman.—p. 42.
Mrs. Freeman's five-star menus.—p. 43.
*Enlist your employees in the fight against waste. L. Weaver.—p. 46.
*Forecasting portion costs. G. L. Wenzel.—p. 47.
New equipment.—p. 56.

Vol. 23, October 1939

The parade of restaurant progress. H. C. Siekman.—p. 39.
Foods in the progress parade.—p. 43.
*Menu styling today. L. D. Freeman.—p. 44.
Mrs. Freeman's five-star menus.—p. 45.
*Profit factors in beef cuts. G. L. Wenzel.—p. 48.
*Weights and measures of beef cuts.—p. 49.
Pie—now and then. M. B. Strause.—p. 50.
*How you can avoid legal liability for patrons' losses. L. T. Parker.—p. 112.
New and improved equipment.—p. 62.

LEGAL LIABILITY. An attorney at law begins a series of articles telling how to avoid big losses from injuries to patrons caused by the negligence of restaurant owners. The outcome of all such suits depends on whether the restaurant owner had knowledge of the danger or defect which caused the injury, and also whether by the application of an ordinary degree of care he should have discovered and remedied it.

PIE. Standards necessary for the production of good pies and their profit possibilities described after a coast to coast tour studying the popularity of pie as a dessert.

MENU VARIETY. Innumerable suggestions for utilizing autumn fruits and vegetables. Recipes included for corn squash, patty pan squash, tomatoes, eggplant, green peppers, red cabbage, celery, carrots, pears, apples, grapes and plums.

DISH BREAKAGE AND SILVER LOSS. Charts entitled "Every Time You Break a Dish This is What it Costs Us" and "Every Time You Break a Glass This is What it Costs Us", portraying the outline of each individual dish, glass and item of silver approximately to scale and shape with the cost in cents recorded in the center of each, should help to secure cooperation of employees in reducing this type of waste.

PORTIONS. The director of the Institute of Fine Cooking comments on the value of forecasting portion costs in order to control food costs. He describes the method of developing a manual which gives the portion cost of every meat, sea food, poultry, vegetable, fruit and dessert item on the menu based upon the initial wholesale purchase price fluctuating from the low, the average or normal price, to the high price range of each food product.

MENU STYLING. A food authority gives menu suggestions for crisp autumn days with special attention to rising prices, fall markets, fall favorites, and the demand for a wide choice of simple foods, well-cooked, seasoned to perfection and palatably combined.

PROFIT IN BEEF. Describes specifications using U. S. Government grading standards developed for meat purchasing and cutting. These specifications are divided into 3 groups based upon the type of restaurant, *i.e.* low priced, medium priced and high priced, in order to secure uniform portions suited to each type of restaurant.

WEIGHT OF CUTS. A chart tabulated by the 1939 Institute of Fine Cooking records weights and specifications of beef cuts based upon the Chicago style of cutting for the low, medium, and high-priced restaurant.

LEGAL LIABILITY. Analyzes recent court cases pertaining to the restaurant operator's responsibility for the guests' property and explains some of the technicalities involved.

Buildings and Building Management

Vol. 39, October 1939

Modern floor coverings.—p. 15.
Modern mechanical equipment. C. J. Lehn.—p. 20.
*Case studies in decorating.—p. 24.
Management liabilities in secretarial suites. L. R. Bloomenthal.—p. 26.
Uniform accounting system.—p. 28.
Fire-fighting deluxe.—p. 31.
*Air conditioning increases employee efficiency.—p. 32.

CONTRACT DECORATING. Contract painting is efficient and economical. The system offers advantages to both the building manager and the contractor with a minimum of executive supervision. The policy maintains a high standard of results at a minimum of costs.

AIR-CONDITIONING. The drafting and survey bureau of the Detroit Edison Company was used as a gauge of efficiency because time studies had been made before moving into the new building. It was found that air-conditioning eliminated small inconveniences and distractions which consumed time and also promoted greater comfort for the worker with resultant increase in efficiency and health.

Consumers' Guide

Vol. 6, September 1939

*Tips for rug buyers.—p. 7.
Financing freedom from household drudgery.—p. 12.
On the consumer front.—p. 14.
*Your food supplies and costs.—p. 15.

RUG BUYING. The synthesis of a rug, wool, cotton and jute, with interesting historical sidelights on origins of Wiltons, Axminsters and Velvets or "Broadloom". Machines are pictured and their use described as devised by the National Bureau of Standards to protect the buyer, retail and wholesale. The importance of wise care of rugs is also stressed with control of dirt, moths, stains, pile bending or crushing and the repair of holes, tears, etc. carefully outlined.

FOOD COSTS. A summary of food supplies and costs are classified and compared with those of last year. Two graphs of foods for definite years and months illustrate the costs of foods by classifications and that of other specific food items.

The Horwath Hotel Accountant

Vol. 19, October 1939

*Uniform system for small hotels. G. O. Podd.—p. 2.
*Reading hotel balance sheets. B. F. Keiper.—p. 3.

RECORDS FOR SMALL HOTELS. Evaluates the need for uniformity in keeping of accounts so that comparisons can be made within an industry. The uniform system of accounts developed by Horwath and Horwath has been accepted by the hotel profession as standard for distribution of income and expense items. Two illustrations of balance sheets are given.

BALANCE SHEETS. Article illustrated with 2 typical balance sheets points out a sound approach to interpreting and reading balance sheets as an aid to checking management plans and policies.

Hospitals

Vol. 13, October 1939

*Frozen foods. H. L. Rockwood.—p. 92.

FROZEN FOODS. Most frozen fruits and vegetables maintain their vitamins as well as, or better, than fresh fruits and vegetables in the market. This is due to the quick-freezing process and the short time between harvesting and freezing. Economy is found in size of package and ability to carry over extra amounts in refrigeration.

Hospital Management

Vol. 48, September 1939

*The cost and recompense in achieving better trained administrative dietitians. A. C. Jensen.—p. 49.
Value of dietetic treatment stressed at A.D.A. meeting.—p. 55.

BETTER TRAINED ADMINISTRATIVE DIETITIANS. Hospitals should provide an opportunity for the student dietitian practically to apply her theoretical knowledge under competent supervision and guidance. The reward to the hospital far exceeds the cost of such training in the efficient service rendered by a properly trained dietitian.

Hotel Monthly

Vol. 47, September 1939

*The high cost of old equipment. W. D. Crouch.—p. 5.
*Is price the index to economy?—p. 8.
*The housekeeper's primer. I. Duties and qualifications of the housekeeper. J. C. Van Ness.—p. 24.
Kentucky serves a meal.—p. 28.
*One hundred years of menu making. A. Shircliffe.—p 31.
"Toast for the world."—p. 33.
*Nantucket coffee shop.—p. 37.
*The coffee shop. E. Boles.—p. 43.

HIGH COST OF OLD EQUIPMENT. Modern kitchen equipment greatly reduces operating costs through fuel savings and gives additional savings by a decrease in waste of prepared food and loss caused by shrinkage and spoilage.

Modern design has effected fuel economies averaging 25%, thermostatic control in steam tables has effected gas economies of 10% to 60%, new heavy duty ranges 30%, bake ovens 20%, coffee urns 25%, steam tables 30%, and deep fat fryers 30%.

BED SHEETS. A discussion of the relative merits of bed sheets. A percale sheet of medium grade is a better buy than a heavy duty sheet even though the heavy duty sheet may stand up under more washings. Figures show that the decreased weight of the percale sheet lowers the cost of laundering more than enough to make up for the difference in wear.

HOUSEKEEPERS' DUTIES. The first of a series of articles written especially for the housekeeper in the small hotel. Lists and describes in detail the duties and qualifications for the successful housekeeper.

HISTORIC MENUS. Describes some of the interesting features of Arnold Shircliffe's new menu book, reproducing some of the menus to be included. The book will include a typical menu for each of the past 100 years to show the changing food habits.

NANTUCKET COFFEE SHOP. This coffee shop is designed to give the atmosphere of a fishing village in old Nantucket. Counter seating affords quick service for the guest and provides maximum turnover in seating capacity. Guests have a full view of food preparation. The menu although à la carte, is so priced that the meal totals no more than the average special combination meal.

COFFEE SHOP. Gives recipes for curry sauce and curry dishes and suggestions for the preparation and use of chicken and turkey.

Journal of Home Economics

Vol. 31, October 1939

Home management and self management. J. K. Folsom.—p. 519.
Popularizing research findings. M. Taylor.—p. 524.
Public health implications of recent research in pellagra and aribofiavinosis. W. H. Sebrell.—p. 530.
*Problems in fat cookery. V. Swartz.—p. 555.
Problems in potato cookery. H. McKay.—p. 557.
*Cooperation of the cafeteria department with other school organizations. M. Farnam.—p. 568.
*Standards of living for student cooperatives. L. Wood.—p. 568.
*Food cost control. D. F. Behm.—p. 569.
*A survey of floor coverings for institution kitchens. H. Zipple.—p. 569.
What is a profession?—p. 578.
Research. Abstracts of papers on food and nutrition.—p. 581.

FAT COOKERY. Unsolved problems relating to deep-fat frying, pastry, cakes and hydrogenated lard are discussed. In deep-fat frying these include: determination of optimum amount of fat absorption, best temperature to obtain this absorption, and the digestibility of fried foods. A new method for mixing cakes made with lard is presented—its worth as yet unknown. Unsolved problems include the relationship of plasticity to shortening power and the digestibility of pie crust.

SCHOOL CAFETERIAS. In addition to feeding students, Cleveland Heights cafeterias are used practically every night for parties and community centers by the Parent Teachers Association. Impartial service is assured because of adherence to carefully drawn up routine procedure by the cafeteria staff. The 6 points of routine are listed but the highlight of the paper by Mary Farnum is the philosophy back of this service expressed as follows: "Each year brings new and unusual requests and demands but the Cleveland Heights School Cafeteria Department willingly cooperates to the best of its ability, remembering that while a party may be just another party to the department staff, it may be *the* party to the organization".

COOPERATIVE DORMITORIES. Students living in cooperatives obtain not only a reduction in expenditures but also social and educational development through their experiences. Work in the cooperative dormitory should not interfere with class schedules and should change periodically to prevent monotony. Cooperation, interest, enthusiasm and ability of student leadership and faculty supervision are essential to the maximum growth of the individual student in the group.

FOOD COST CONTROL. Thoughtful menu planning, prudent buying, watchful storeroom control and accurate records are essential to a successful food cost control system. A simple,

efficient system makes employees more careful of the food, keeps the dietitian in touch with market conditions, aids in handling employees, reduces waste and aids departmental control.

FLOOR COVERINGS. Purchasing standards for institution floor coverings should be based upon accurate and detailed specifications for materials and installations. Problems found in making new and old installation are considered. A list of desirable qualities in institution floor coverings is included. Cement floors are to be avoided, terrazzo and quarry tile are desirable, within certain limitations, and composition floors have been found suitable for small institutions.

Modern Hospital

Vol. 53, October 1939

*Diets, purchasing and dishwashing are favored topics at dietetic section.—p. 73.
*Problem in the pantry. M. L. Burt.—p. 100.
*Dietetics in China. H. B. Drummond.—p. 104.
*Food clinic proves itself. M. E. Tarbox.—p. 108.

DIETS, PURCHASING AND DISHWASHING ARE FAVORED TOPICS AT DIETETIC SECTION. Short reports of topics discussed at A.H.A. convention. Dr. F. F. Tisdale talked on the efficiency of diets; Ruth M. Park spoke on leadership and education background of the hospital dietitian; and B. Hunzicker spoke on dishwashing and its problems.

PROBLEMS IN THE PANTRY. An analytical study of a maid's job in a small floor kitchen. Includes time studies of good and poor procedure, and methods that improve maid's work.

DIETETICS IN CHINA. Article on Chinese food and dietary in Union Medical College. Both foreign and Chinese food is served with an average per capita cost ranging from 17¢ to 50¢ depending on class of diet.

FOOD CLINIC PROVES ITSELF. The ambulatory patient needs instruction and care in the food clinic. Time and energy expended in this direction pay for themselves in preventing hospitalization of clinic patients. Hospital administrators and physicians who have had the aid of food clinics are unanimous in their opinion that it is an invaluable service.

The Nation's Schools

Vol. 24, October 1939

Developing social personalities. L. N. Neulen.—p. 53.
*Food selection for health. E. A. Martin.—p. 62.
*Snack shop is social center. N. Fredenburg.—p. 66.

FOOD AND HEALTH. Surveys of food habits among school children show the need of the school lunch as an educational factor in correcting bad habits.

CAFETERIA AS SNACK SHOP. A high school cafeteria director tells how her faculty lunchroom has become an after-school center and snack shop for the students, providing wholesome amusement and refreshments such as soft drinks and candy at a time when the student need not make the difficult choice between these and an adequate lunch.

Personnel Journal

Vol. 18, September 1939

Labor's point of view. C. S. Golden.—p. 82.
*Collective bargaining case studies. C. S. Slocombe.—p. 92.
*Seniority plans. R. D. Dauterich.—p. 114.

COLLECTIVE BARGAINING. Case studies illustrating 3 different collective bargaining set-ups that have been and are developing with both affiliated and independent unions; 6 brief reports show how changes come about from 1 type to another. Suggestions for technic in negotiating and improving employer-employee relations are unusually explicit.

SENIORITY PLANS. Discussion of seniority in connection with lay-off, rehire, and promotion again brings up the question of accurate determination of the value of existing qualifying factors.

Restaurant Management

Vol. 45, September 1939

*Restaurant cost chart.—p. 14.
*The Charleston garden. W. O. Voegele.—p. 20.
*Cereals for your daily menu.—p. 24.
Prize menus.—p. 28.

COST CHART. A compilation of figures from a group of successful restaurants of the following

types: soda lunch, tea room, cafeteria, lunchroom and table service. Shows how the costs are divided and the percentage of profit for each type. Lack of knowledge regarding costs is the principal reason why 75% of all new restaurants which open each year fail or change hands within the first 12 months.

CHARLESTON GARDEN. Outlines methods in a restaurant that effects a fast turnover unobtrusively. Each employee performs 1 specific duty. Table clearing and setting up is eliminated by prearranged, individual set-ups on trays that fit into the tops of the specially designed tables—all of which hold 2 trays.

CEREALS FOR BREAKFAST. Breakfast is the slowest meal of the day but this situation can be improved by clever merchandising. The menu should consist of a few good club combinations containing fruit and cereal as most of the customers will order the club breakfast. Attractive and informative window displays will bring in customers. For greater profits know your costs by working out a series of cost and sales price tables similar to one illustrated in article.

NEWS NOTES

Educational Exhibits Committee, A. D. A. For the coming year, Katharine Brown, vice-president of the A. D. A., will serve in an advisory capacity to Edith Graham, Passavant Memorial Hospital, Chicago, newly appointed chairman of this committee. As a member of the Executive Board, Miss Brown will be in a position to note trends in the Association and to pass on ideas and suggestions concerning exhibits for the coming year.

Finance Committee, A. D. A. Mable MacLachlan, University Hospitals, Ann Arbor, Michigan, has been appointed a member of this committee by Mrs. Beula B. Marble, President of the Association. Ella M. Eck, University Clinics, University of Chicago, the national treasurer, Margaret Cowden, who serves as chairman of this committee, and the president and president-elect, constitute the personnel of this committee.

Reports of Special Group Dinner Meetings Held at the Twenty-second Annual Meeting, American Dietetic Association, Los Angeles. Eleven special group meetings were announced for Wednesday evening, August 30. This annual feature, initiated at the Milwaukee meeting, is proving very popular since it offers an opportunity for group discussion of specialized interests, all of which might not otherwise have full representation in the formal program. Three special groups scheduled on the program, Private Mental Hospitals, School Lunchrooms, and Small Hospitals, did not meet because of conflict with other group interests. The following are summarized reports of the several meetings:

The Teaching of Nutrition to Medical and Dental Students. Fourteen members attended the dinner, as reported by Mrs. Gladys H. Silkey, Firmin Desloge Hospital, St. Louis. Ten states, Massachusetts, Michigan, California, Illinois, Tennessee, Missouri, Ohio, New York, Virginia and Nebraska were represented, and also New Zealand. Outstanding interest was shown in replies received from medical and dental schools concerning courses in nutrition. Of the 82 questionnaires sent to deans of medical schools, 76 were answered. Thirty-nine of the 44 questionnaires sent to deans of dental schools were returned. Dr. Helen S. Mitchell presented a small chart which showed very effectively the number of schools offering separate courses in nutrition, those offering nutrition as part of another course and those giving no instruction in nutrition. This information may prove helpful as exhibit material for medical and dental groups. There was considerable variation in the type of material presented, and likewise, the number of class hours varied from as few as 4 to as many as 48.

Frances MacKinnon led the discussion which centered mainly around the two questions: In what year should such a nutrition course be offered? What is the most effective course?

It was generally agreed that there was no connecting link between Physiological Chemistry and Dietetics in many schools. The group indicated that possibly the best opportunity for such correlation would be afforded during the senior year when the students are on service in the medical wards with opportunity to study the clinical aspects of nutritional problems.

Several comments were made regarding the increase of instruction in postgraduate education for practicing physicians. The institute to be held at Syracuse University, New York, during the month of October, in which physicians and dietitians were to participate, was cited as an excellent opportunity for teaching nutrition.

Public Health and Public Welfare. The twenty-five dietitians attending this meeting, as reported by Clare Hartnett, Seattle, Washington, represented the following organizations: state and local departments of health; public relief and welfare agencies; private welfare and health agencies; hospital out-patient departments; health council organizations; home economics departments in universities and state colleges, extension services and the Y.W.C.A. All reports at this meeting indicated a concentration on staff education, integration of program with all other agencies in the field as well as the formation of health councils for the purpose of showing need for more nutritionists, and working through a local clearing house to avoid duplication of program. The following activities were reported by the various workers: consulta-

tion services to local health departments, local school lunch projects, home economics teachers, health education teachers, student bodies in high schools and colleges, local welfare staffs, and health council and community chest organizations; assistance on staff education and refresher courses to such professional workers as public health nurses and child welfare case workers; volunteer assistance by home economists (by virtue of their college training) and members from state dietetic associations wishing to make a contribution to community education; consultation service and staff education in those agencies working with women in industry and similar groups; and consultation service, staff education, group teaching and home visits in those agencies which include intensive family case work and bedside nursing service.

There was a definite trend from concentration on the needs of the malnourished child to the daily needs of every well child. The group expressed a desire for effective ways and means of disseminating details of the programs of the various workers to other workers in the field. Round robin news notes were suggested. It was further suggested that news notes in the JOURNAL afforded a channel for such information. The state community education chairman might well serve as a center, it was believed, for all interesting details of the various programs being carried out. She could in turn send a summary of such activities to the Journal editor.

Food Service in Colleges. This meeting was attended by 38 directors of services and others interested in 19 different states. According to the reporter, Mrs. Bessie Brooks West of Kansas State College, Manhattan, the meeting opened with a discussion concerning how to obtain more openings for dietitians in college food services. It was recommended that an approach be made to those in charge of hiring the personnel in colleges in an attempt to interest such persons in the employment of trained directors of their food services. In connection with the housekeeping responsibilities in college food service departments, approximately half of those attending the meeting had control of both the food and housekeeping responsibilities. It was indicated that there is a definite and growing need for more adequate training in housekeeping.

In discussing the problem of student labor, it was found that the rates range from 21 to 40 cents per hour. In some instances room and board are given in return for 3 hours' work per day. With regard to the laundering of uniforms, in general these are furnished and laundered by the college. In answer to the problem of competent student help, rating charts were suggested as a means of accumulating evidence of the student's ability and to avoid the "chronic dissenters".

Some of the problems which demand further research concern student labor, dish breakage, and proper holding temperatures for cooked food. In connection with this it was recommended that the chairman of the Administration Section of the A. D. A. present to the Executive Board the need for a joint committee to work with the Institution Administration section of the A.H.E.A. in devising research problems, thereby eliminating the possibility of repetition of effort.

Dietitians in Private Medical Clinics and in Consulting Work. Eighteen dietitians were present, as reported by Ruth Bowden of the Sansum Clinic, Santa Barbara, California. Six from private medical clinics in Oregon and California gave brief talks on the organization of their work, method of obtaining orders, inspection of charts, method of instruction (class room and individual), use of supplementary material and miscellaneous matters.

Several others present reported on their work, among them Helen Pond of St. Luke's Medical Hospital, Tokio, Japan, who spoke of the present situation there regarding the food problem. A more complete report of work in private medical clinics on the west coast will appear in a later issue of the JOURNAL.

Large Hospitals. Frances D. Wyness, Vancouver General Hospital, Vancouver, B. C., reported the meeting and also led the discussion in which 14 dietitians participated. In commenting on the requisites for successful work in this field, Miss Wyness expressed the need of better personnel and interdepartmental relationships. The dietitian must also be familiar with the hospital's policy and keep always in mind that the dietitian represents one of the newest groups in the hospital and therefore must acquire tolerance and sympathy with those groups having seniority of service. With this background of attitude the way is open to make the dietitian's services effective in the health, education, and social service program of the

large hospital. The security and efficiency of the dietary department depend upon the degree of esprit de corps throughout the department from the director to the last bus boy on the staff.

Means of attaining better cooperation with other hospital departments were suggested as follows: that the dietetic staff make themselves very approachable to all members of other departments; that criticisms of any member of the staff be made directly to the head of the department; that the dietitian members of the department avoid the tendency to on duty and off duty isolation from members of the nursing staff.

In discussing food service the centralized tray service seemed to be preferred for private patients if a separate kitchen can be maintained, and the decentralized type for the wards. For nurses, waitress service seemed to be preferred to cafeteria.

It was the general opinion that organized educational programs are not enthusiastically received by graduate members of the dietary staff. However, the idea of a journal club which would meet monthly to review articles from professional magazines was well received.

Children's Hospitals. Although the number of dietitians in children's hospitals is comparatively small, it was felt that the problems in child nutrition, both normal and therapeutic, of specific interest to the dietitians in the children's hospitals, are of basic importance to the Association as a whole. Therefore, as reported by Mrs. Gwen Wedlake, Children's Hospital, San Francisco, the group proposed to enlist the aid of dietitians in all children's hospitals in formulating a program of instruction for hospitalized children, individually and in groups, in the principles of normal nutrition. They plan to gather suggestions from nursery schools, recreational directors, supervisors of child development centers and other sources. The aim is to produce a guide which dietitians may follow in teaching nutrition by means of games, rhymes, songs, stories and other material suitable for the various age groups and degrees of physical handicap.

Public Institutions and Hospitals. Twenty-three dietitians representing 12 states attended this meeting, as reported by Jane Sedgwick, Department of Institutions, State of California. Miss Sedgwick, who opened the discussion, mentioned the following dietitians as having been identified with important developments in the field of public institutions: Leila J. Hooper, Arizona State Hospital, Phoenix; Nelle W. Massey, state nutritionist, Department of Public Welfare, Indiana; Mrs. Christine R. Pensinger, Department of Public Welfare, Springfield, Illinois; Mrs. Elizabeth N. Waters, Bureau of Health, Augusta, Maine; E. Grace Clark, Pontiac State Hospital, Pontiac, Michigan; Dorothy Ridler, Welfare Federation of Cleveland; Florence Peters, Department of Welfare, Harrisburg, Pennsylvania; Winifred Yates, Department of Institutions, Lincoln, Nebraska; and Marion Waters, Children's Bureau, Richmond, Virginia.

Emma Feeney of Pratt Institute, New York, called attention to the need for a further clarification of the status of the dietitian in public institutions, since in many states her salary depends upon her classification.

Mrs. Pensinger then discussed her work in the state of Illionois, further details concerning which will be published later in this JOURNAL.

Millie Kalsem of Cook County Hospital, Chicago, discussed dietary procedures in her hospital, followed by Alma Bering of Sheppard Pratt Hospital, Maryland, who spoke of her work in a large private institution for mental cases. She showed charts displaying different types of menus and illustrations depicting recreational activities of the hospital and other data concerning the management of the dietary department. Miss Bering emphasized the need of building a "social life" into the "food situation". Miss Kalsem agreed with this viewpoint and stated that a pleasing atmosphere for dining rooms appeals to many patients in such institutions and decidedly influences their interest in food.

Miss Sedgwick commented on the need of an organization of dietitians in public institutions to work through the A. D. A. in order ultimately to strengthen the status of members in this field. It was moved that Mrs. Pensinger be recommended to further this development in the national Association with a view toward the placing of more dietitians in narcotic institutions, veterans' hospitals, prisons, homes for the blind, homes for the feeble-minded, mental hospitals, correctional schools and board schools (Indian service).

Miss Sedgwick then offered the following reso-

lution: "Be it resolved that a group be formed as a part of the Administration Section of the American Dietetic Association to be known as the Public Institutions." The objectives of this group will be: "1. To act as a group which will set standards for food service in public institutions of various types. 2. To act as a clearing house for public institutions' problems. 3. To set up an organization which will bring to the attention of public institutions not now employing dietitians the need for this type of service." The resolution was to be presented by Grace Bulman, Administration Section chairman, to the president of the A. D. A.

At the request of Mrs. Beula B. Marble, incoming president of the A. D. A., representatives of each of the above special group meetings were asked to meet with national section chairmen and the president so that any requests coming from the various groups could be considered in planning the national program of work for the year. The requests were considered from the standpoint as to whether they would fit into activities of national scope and general interest, or into those under state supervision, or as problems of special interest to a small selected group of dietitians scattered or centrally located.

Mrs. Marble emphasized that any work planned should have a definite objective: that is, the results should be written up for presentation at the national meetings or in the columns of the JOURNAL. Projects, she said, should be planned to go beyond the mere distribution of questionnaires and should end with the collection of interpretive data, practically applicable to real situations confronting dietitians. Other projects might result in the completion of material suitable for individual publication, such as the quantity recipes. Beyond this, work on these projects in itself yields worthwhile experience and stimulates individual professional activity and alertness.

A general discussion followed in which Mrs. West, Mrs. Alice Smith, Frances Wyness, Ruth Bowden, Mrs. Gladys Silkey and members of the Executive Board took part. It was recommended that the chairman of the Administration Section consider the appointment of a committee to work jointly with the Institution Administration Section of the A. H. E. A. on research problems in administration, with a view to eliminating the possibility of duplication of effort. It was further recommended that news of interest to workers in public health and welfare agencies be included under the news section of the JOURNAL, that a scrapbook concerning the work of this group be prepared for display at exhibits, and that a central file for material be made available through the library service of the Association. Full discussions of the other groups were presented but no recommendations were made.

The Eighth Biennial Conference of the National Association for Nursery Education was held at the Hotel Pennsylvania, New York City, October 25–28. The program consisted of general sessions and discussion groups covering a wide field of interests devoted to the physical, mental and social development of the child. Addresses of particular interest to the dietitian were the following: "Implications of a Growth Study of Two Hundred Children", Jean Macfarlane, University of California, Berkeley; "Recent Findings on the Physical Development of Young Children", Dr. Robert W. Culbert, Babies Hospital, New York City; "Physical Development and Health Care"; Elda Robb, Temple University; and "Recent Findings in Nutrition Related to Child Development", Mary Swartz Rose, Teachers College, Columbia University, New York City.

A group of dietitians, nutritionists and nurses took part in the group discussion on "Nursery Education in Health Programs Under Public and Private Auspices". Among these were Leona Baumgartner, Bertha Jenkins, Olga L. Lommen, Pauline Murrah, Elda Robb, Mary E. Sweeney and Dorothy Whipple.

The Twelfth Graduate Fortnight of the New York Academy of Medicine was held October 23 to November 3. The subject was "The Endocrine Glands and Their Disorders". As in past years the meeting consisted of round table conferences, hospital clinics and evening sessions at the academy. Of particular interest to dietitians were addresses by the following speakers: Dr. Herbert M. Evans, "Historical Sketch of the Development of Endocrinology"; Dr. David Marine, "Physiology and Principal Interrelations of the Thyroid"; Dr. James H. Means, "Hypothyroidism"; Dr. Harold Thomas Hyman, "Aspects of Hyperthyroidism"; Dr. Walter B. Cannon, "The Adrenal Medulla"; Dr. Cyril

N. H. Long, "The Adrenal Cortex"; Dr. Rollin T. Woodyatt, "Relation of Diabetes to the Endocrine System".

Statler Hotel Company Establishes Department for Research. The Hotel Statler *News* for September 1939 announces plans for the construction of a new, enlarged and fully equipped Hotels Statler Research Department at the Hotel Pennsylvania, New York. The layout, which will cover many thousand square feet, will include a large room to be used for conferences, as a dining room for testing menus, and to house the Statler research library. An exhibit room will be provided for displays of china, linen, glass and other accessories.

The kitchen, as the principal unit of the department, will be divided into two sections, one for testing recipes on a domestic scale, and the other for preparation of recipes to be adapted to hotel requirements. It will be completely equipped with the most modern devices for preparing, cooking and serving foods, and will have both gas and electric ranges and ovens, suitable for different types of dishes. Mr. John L. Hennessy, vice-chairman of the board of directors, plans to bring in the Statler chefs and dietitians from time to time, to take part in a school of instruction, including preparation and cooking, and the development of new recipes, pastries and salads.

For almost 25 years the Statler organization has maintained an experimental kitchen where many of the Statler-tested recipes have been developed to their present high standard. With the new and enlarged department, however, a more complete job can be done in various phases of research for Statler hotel operations.

General Baking Company, bakers of "Bond Bread," entertained the Student Dietitians' Club of New York at their Brooklyn Bakery on October 19. Lillian Emoff, Montefiore Hospital, president of the club, and Inez Somers, home economist for the General Baking Company, received the guests. Mr. George Higgins, manager, spoke on "The History of the General Baking Company". After a trip through the bakery, music, dancing and refreshments completed the evening's entertainment.

Dr. Jean E. Hawks, assistant professor of nutrition in the Department of Foods and Nutrition, Michigan State College, in private life Mrs. F. N. Hewetson, has announced the birth of a son, John Francis, on July 3, 1939.

Cora Colburn. The death of Miss Colburn, director of student food service at Yale University, on October 2, was reported in *Time.* Other college food service directors looked upon Miss Colburn as the senior member, both in length of service and because of her notable accomplishments in the field. Before taking up her work at Yale Miss Colburn was at the University of Chicago. Her whole-hearted devotion to her work is indicated by the fact that at seventy years of age she was still feeding college students.

Emily C. Timlow, a former resident of New York City and now of 1854 Vallejo St., San Francisco, writes to the JOURNAL as follows while on board the *Argentina Maru*: "I was very sorry not to see my A. D. A. friends when they were in California but at that particular time I was reveling in the beauties of the Chilean and Argentinean lakes with their magnificent surrounding mountains, which were glorious with their snow covering, glistening in the sun against a deep blue sky. I have had an intensely interesting trip down the Pacific coast to Valparaiso and up the Atlantic coast from Buenos Aires through the Panama Canal back to the Pacific Ocean. What I have seen, heard and read has given me much food for thought. I was interested in observing the effect of climate, arable soil, geographical location and transportation facilities upon the diet, which varied even in adjoining countries. I have been wondering whether, in time, an improved general diet may make our neighbors to the south better able to cope with their many complex problems."

Massachusetts Dietetic Association. On October 3 Dr. W. P. Murphy, associate in medicine, Harvard Medical School, addressed the association on "Nutrition Deficiency and Anemia".

At the November 7 meeting the speaker was Ida Cannon, chief of social service, Massachusetts General Hospital, and her subject, "Some Common Interests of Dietitians and Social Workers in the Field of Medicine".

North Carolina Dietetic Association. The executive board met at Salem College, Winston

Salem, September 30, with Mrs. Elizabeth O. Meinung presiding. Following the business session, reports from the national meeting were given by Mrs. Meinung and Jane Hereford, representative to the House of Delegates.

Oklahoma Dietetic Association. The Oklahoma *Dietitian* reports that on September 7, St. Anthony Hospital held its first graduation exercise for student dietitians. The following received certificates: Mary Moran, St. Paul, Minn.; Ollie Agneberg, Perth, N. D.; Alfreda Sloan, Norman, and Juell Little, Custer City. The 1939 entrants are Dian Keith, Central State Teachers College; Marjorie Rose and Helen Trieschman, Purdue University; Phyllis Murphy, Marymount College, Leavenworth; and Florence Fritton, St. Mary's, Leavenworth.

Mrs. Josephine McCulley Barr, dietitian at St. Anthony Hospital, has resigned her position owing to illness. Mary Moran will replace Mrs. Barr.

Dorothy Swartz has been appointed dietitian at Northwestern State Teachers College, Talequah. Miss Swartz, who has applied for membership in the A. D. A., took graduate work at Oklahoma Agricultural and Mechanical College and completed the institution training course there, and last year served as cafeteria director and instructor of commercial cookery at the Ponca City High School.

Alfreda Sloan has accepted a position as food production supervisor at the Ashville Junior College, Sawannanoa, N. C.

Philadelphia Dietetic Association. The November 14 meeting, in charge of the Professional Education Section, was held at the Drexel Institute of Technology, with the following program: Mr. George C. Galphin, assistant professor of education, Drexel Institute of Technology, "Modern Trends in Education"; and Marjorie Sims, instructor of home economics, Drexel Institute of Technology, "Home Economics in the Educational Program". The Home Economics Association of Philadelphia were guests at this meeting.

On November 21 the association gathered for field trips to Fitzgerald Mercy Hospital, where Sister M. Bernadine acted as hostess, and to Temple University Hospital, with Alice M. Karslake as hostess, in order to inspect the "Trayveyor" type of food service.

Rhode Island Nutrition Association. The first number of *Nutrition News*, published by the association, was issued in October, and carried a message from the president of the association, Florence H. Case, an announcement by Esther Batchelder of a new course in nutrition at Rhode Island State College, a report of the Conference of Community Nutritionists held in Boston on September 30 and that of the American Chemical Society in Boston September 11–15. Other features included brief abstracts from current literature and a short summary of Dr. E. Neige Todhunter's address at the 1939 session of the American Dietetic Association. The committee in charge of the new publication consists of Florence H. Case, Charlotte Haupt, Eleanor Wells, Jane Ebbs, Mrs. Arthur J. Minor, and Meredith Mayfield, chairman, Rhode Island State College, Kingston.

News from our Advertisers and Exhibitors. The tested recipes distributed through the Institution Department of the *General Foods Corporation* and developed under the direction of Bertha Nettleton are outstanding among such material available from commercial concerns. Recent distributions include a helpful food chart showing food values of average servings of certain food materials; "Come and Get It!" a handy guide to camp cookery, giving menus and quantity recipes for soups, main dishes, and on through the menu; and a beautiful booklet entitled "Salads and Entrees" with interesting menus and illustrations and Miss Nettleton's uniformly excellent recipes. Other folders give helpful suggestions for use of the General Food's various beverage products, their Jellos, Swansdown flour, and one on the ever popular chiffon pies in amounts suited to institution requirements.

The Chicago Dietetic Supply House is making a special offer to hospitals on the new improved Hanson dietetic scale. If you have old scales which are worn out or badly in need of repair they will allow a $1.00 trade-in allowance on any dietetic scale regardless of make or condition which means that this new improved Hanson dietetic scale may be purchased for $5.40 plus postage to your institution. If you have dietary scales which you would like to have adjusted or on which you would like to have minor repairs they would be glad to take care of them. In

most cases, however, where dietary scales need extensive repairs it does not pay to try to repair them.

The Cream of Wheat Corporation, Minneapolis, has descriptive circulars on the food content of their new 5-Minute Cream of Wheat and a brochure entitled "Feed the Baby" which covers the physical and psychological aspects of the problem from birth to the school age, with recipes, available upon request.

"*The 'Junket' Folks*", Little Falls, New York, are introducing their new "Danish Dessert" which may be used as a dessert or a filling for cakes, pies and puff cases. Descriptive circulars on this and recipes for use of the Junket Freezing Mix are available upon request.

WHO'S WHO IN THIS ISSUE[1]

Agnes Fay Morgan received the B.S., M.S. and Ph.D. degrees from the University of Chicago in the Department of Chemistry. She is one of the leaders in the field of food and nutrition research in this country and during the past twenty-five years she has published nearly ninety research reports. In 1915 Dr. Morgan was appointed assistant professor of nutrition at the University of California at Berkeley, where she organized the department of household science in 1916 and in 1938 changed this department into a Division of Home Economics in the College of Agriculture. At present Dr. Morgan is professor of home economics, chairman of the department, and biochemist in the Agricultural Experiment Station. While her research has always been concerned with the chemistry of food and nutrition, her particular interest has been the distribution and function of the vitamins. For a number of years she has carried on active research on hypervitaminosis D and parathyroid secretion, the functions of the vitamin B_2 complex, the effect of heat on the nutritive value of protein, and the vitamin content of fruits and fruit products. Her original work on the anti-grey hair filtrate factor in the vitamin B_2 complex, the most recent of her researches, has attracted wide interest. With this background of attainments her comments in this JOURNAL should carry great weight with dietitians.

Effie I. Raitt has been director of the School of Home Economics of the University of Washington since 1912. Miss Raitt pioneered as a dietitian in the hospital field, having served as "dietitian and steward" at Massachusetts State Hospital, and dietitian at St. Luke's Hospital, New York City. She was formerly a house director of the residence halls, Northwestern University. Miss Raitt is a former vice-president of the A.D.A. and past president of the A.H.E.A.

Herbert M. Evans, M.D., anatomist and embryologist, gained world-wide fame in 1922 for his discovery, with K. S. Bishop, of vitamin E, necessary for reproduction in higher animals. Dr. Evans was also the first to produce gigantism and specific endocrine effects of raw anterior hypophyseal hormones administered parenterally. He is a fellow of the American Association for the Advancement of Science, American Physiological Society, Society for Experimental Biology, and National Academy of Sciences. Since 1930 Dr. Evans has been Hertzstein professor of biology and director of the Institute of Experimental Biology of the University of California at Berkeley.

J. Ernestine Becker, associate in the Department of Biochemistry of the School of Hygiene and Public Health, The Johns Hopkins University, Baltimore, was noted under this section for May 1939.

Frank G. Boudreau, M.D., is a graduate of McGill University. He is the author of numerous articles on epidemiology, public health administration and international cooperation in hygiene. Dr. Boudreau was a member of the Medical Reserve Corps during the first World War and on returning from foreign service he was commissioned as major. In 1925 he was appointed statistician-epidemiologist of the League of Nations and later he served as acting director and director of the Health Organisation of the League. In connection with this work Dr. Boudreau travelled extensively in Europe, the Far East and South America. Since 1937 he has been executive director of the Milbank Memorial Fund. His wide experience permits him to speak with authority on the subject discussed in this issue.

[1] Through an unfortunate switching of copy when the November JOURNAL was made up at the press, the above material was inadvertently included in the November JOURNAL.

INDEX TO VOLUME 15

The following abbreviations indicate in which section the material indexed appears: ab., abstract under current literature; a.r., annual reports; c.c., current comment; ed., editorial. A star (*) indicates an original article appearing in this JOURNAL. Author index, which appears following subject index, includes only the names of authors of original material appearing in this JOURNAL in full or abstracted under the editorial section, and names of authors of books reviewed.

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MORE FACTS ABOUT IRRADIATED EVAPORATED MILK FOR INFANT FEEDING

From "RACHITIC STUDIES" by Earl W. May, M.D. and Thelma M. Wygant, M.D., Detroit, reported in the May, June, and July, 1939, Archives of Pediatrics.

89 premature, weakling, and full term infants comprising the "prophylactic" group were fed Irradiated Evaporated Milk; similarly, 70 infants comprising the "control" group were given non-irradiated Evaporated Milk. The following findings are recorded:

FULL TERM INFANTS—"None of the fifty-one normal full term infants in the 'prophylactic' group developed rickets. The linear growth and gain in weight were better than average in this group . . ."

WEAKLING INFANTS—"None of the twenty weakling infants of the 'prophylactic' group developed rickets. Thirteen of the weakling infants in the 'control' group, however, showed rachitic changes before six and one-half months."

PREMATURE INFANTS—"Eighteen premature infants were studied in the 'prophylactic' group. Two of these infants developed rickets. The rachitic process in one infant was very slight and became healed when the infant was continued on the feedings of irradiated evaporated milk."

GENERAL COMMENT—"No skin irritations, regurgitation, vomiting or diarrhea could be attributed to the feeding of irradiated evaporated milk over long periods of time."

These studies do not indicate any departure from the customary administration of, nor is it intended that Irradiated Evaporated Milk should replace the antirachitic medicinals which the physician regularly employs. Yet, in this as in numerous other studies, Irradiated Evaporated Milk showed a high degree of anti-rachitic efficacy.

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METHODS FOR QUANTITATIVE ESTIMATION OF THE VITAMINS

III. Measurement of Vitamin A Activity

It was early recognized that vitamin A deprivation in animals resulted in cessation of growth or—if long continued—in the appearance of a characteristic eye condition known as xerophthalmia (1). These two pathologic effects were both utilized in the first methods proposed for quantitative estimation of this essential food factor.

The earliest techniques for determination of vitamin A were similar in that they all first provided for depletion of the body stores of vitamin A of the rat by restriction of the animals to basal rations free from or quite deficient in the vitamin. In the "rat growth" method, the vitamin A activity of the material under assay was estimated by feeding graded dosages to animals depleted of the vitamin (as gauged by cessation of growth) and recording the ensuing growth response (2). In the "curative technique," the incidence of xerophthalmia served as the criterion of vitamin A depletion (3), and vitamin A activity was estimated by determining the dosage of the test material necessary to establish cure of xerophthalmia.

Techniques were also gradually developed which in some instances embodied features of both the growth and curative methods. Still another technique based on the continuous appearance of cornified epithelial cells in vaginal smears—a further characteristic of vitamin A deficiency in female rats—was evolved (4). Further research showed that colorimetric and spectrographic methods may be adapted to the estimation of vitamin A activities of specific materials (5).

Of all methods for estimation of vitamin A in foods, the rat growth technique appears to be favored today (6). Gradual improvements and refinements—as well as recognition of the existence of provitamins A—have led to development of the growth method now included in the U. S. Pharmacopeia XI. This method requires that young rats weighing 40 to 50 grams (at an age not exceeding 28 days when placed on a vitamin A deficient ration) shall manifest symptoms characteristic of vitamin A deficiency within a period of 25 to 45 days. Rats properly depleted of vitamin A reserve are assembled in negative control groups receiving no supplement, reference groups receiving graded doses of the standard reference material, and assay groups receiving graded doses of the assay material. During the ensuing period of not less than 28 days, the test animals are fed daily doses of the proper supplements. The body weights of the animals are recorded at frequent intervals during and at the end of the assay period. From the average gains in body weight of rats in the assay and reference groups, dosages of assay and reference materials, and the vitamin A activity of the standard of reference, the vitamin A activity of the assay material is calculated.

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(1) 1913. J. Biol. Chem. 16, 423 and 255.
(2) 1928. J. Biol. Chem. 78, 671.
(3) 1931. J. Dairy Sci. 14, 229.
(4) 1927. J. Biol. Chem. 73, 153.
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1936. Mass. Agr. Expt. Sta. Bull. No. 338.
1938. Nutrition Abstracts and Reviews, 8, 281.

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